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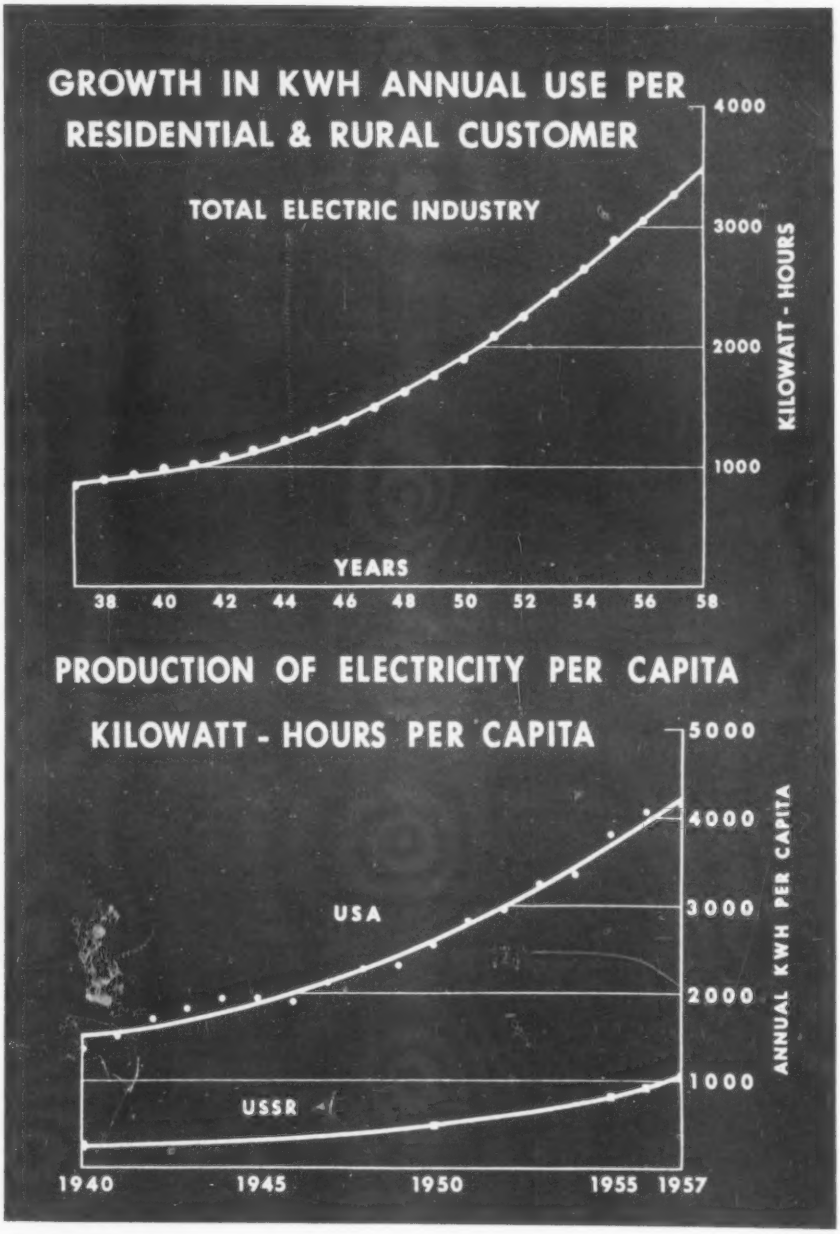

Electric utility progress stabilizes U. S. economy—page 22

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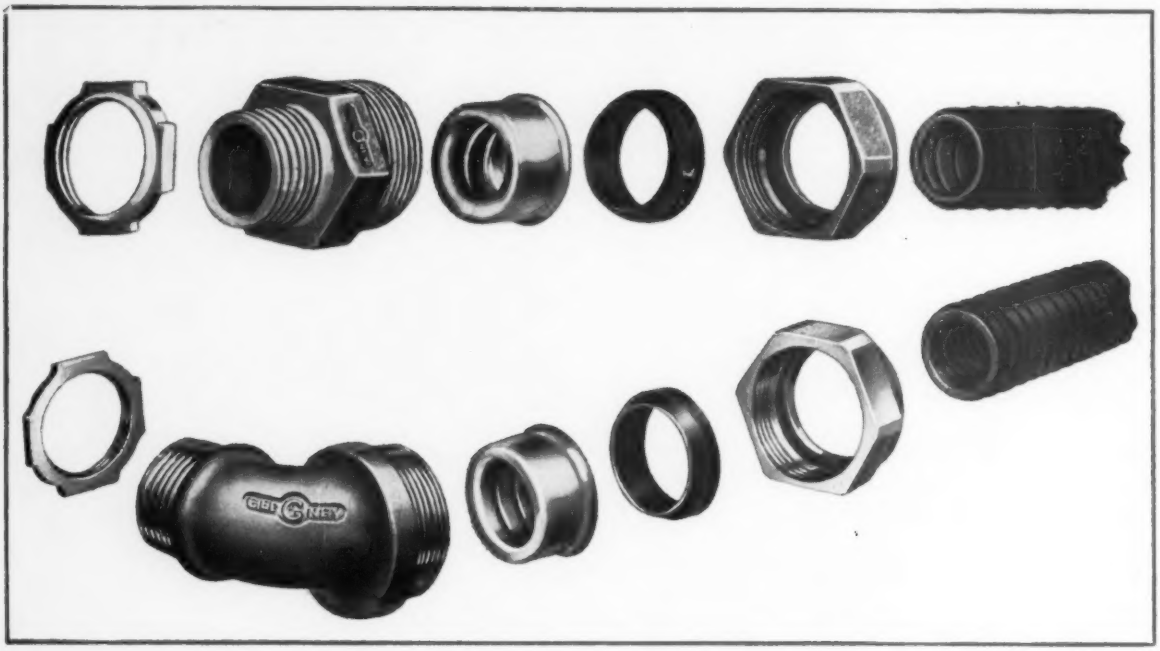

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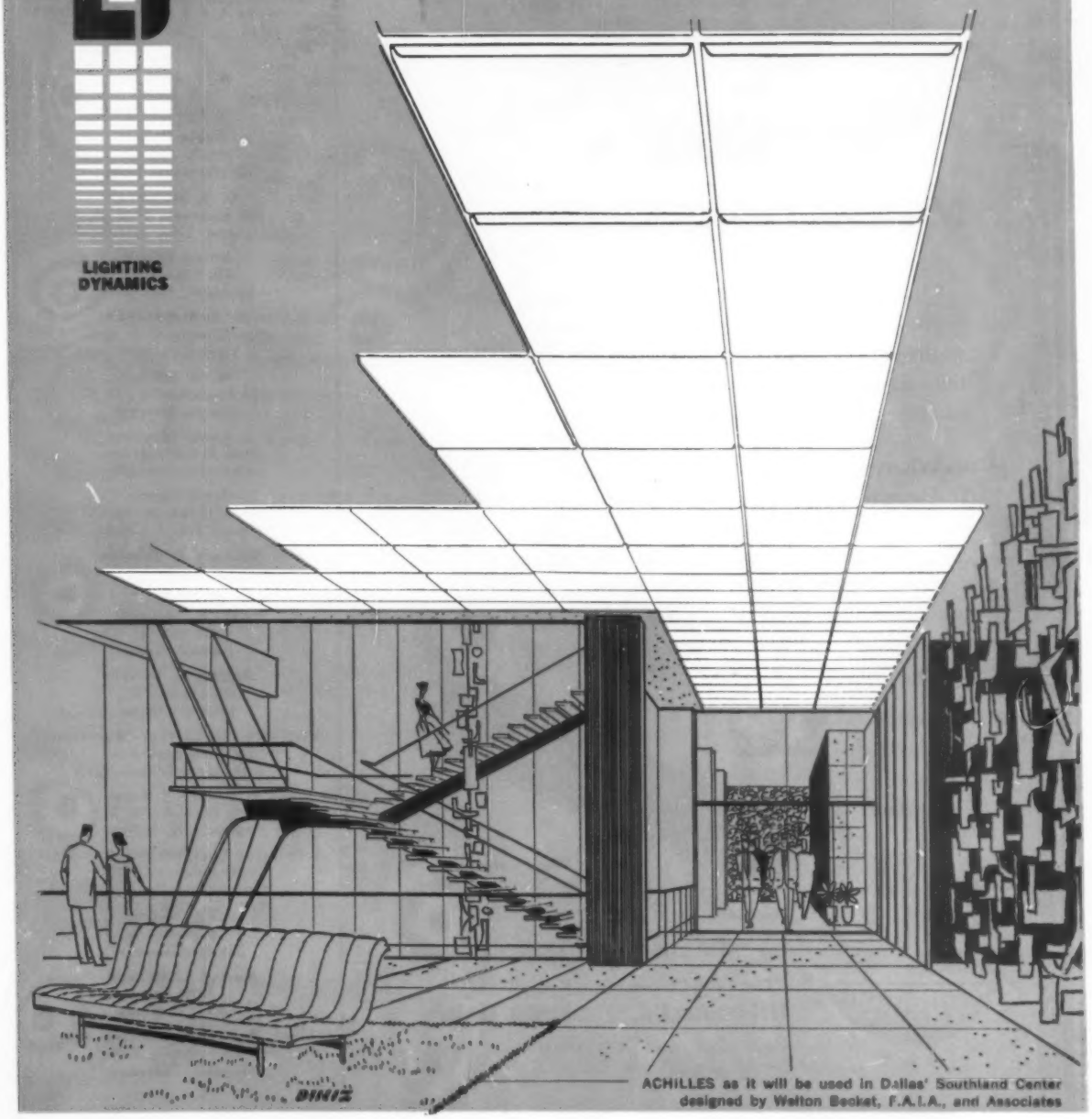

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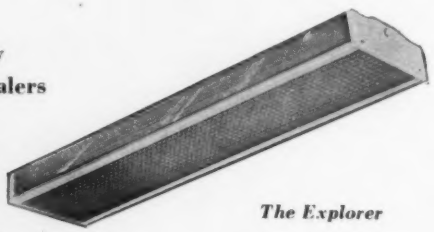

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Economic comment

by J. Whitney Bunting, Ph.D.
Contributing Economics Editor

Economics—1959

◆ THE END of 1958 has seen great economic improvement over the beginning, and the result of this factor should create greater optimism in business circles for the coming year. In fact, it is true that optimism reigns high among business leaders, but variance arises when the degree of prosperity is considered.

Current thinking places 1959's economic activity at any place from slightly above that of 1958 to a much better full year level. However, if a consensus were taken, it would show a strong tendency to believe that only a modest increase of activity would be recorded next year.

The basic reason for the belief in good times for 1959 is the continuing confidence that the foundations of the American economy are strong. For example, even the modest recession of the past year caused little let-up in consumer buying and spending. The big reductions in purchasing were those of business and industry itself, and, when over-all business was evaluated, it was consumer spending that maintained the nation's economic pace.

This fact has been an eye-opener to the business and industrial executives for it shows most clearly that consumers have had a greater confidence in business activity that have the businessmen themselves. Usually recession times tend to limit the impact of consumer expenditures. Business plant expansion and governmental buying have to take up the economic slack.

Dr. Bunting is a well-known economist and educator having special knowledge of the South.

Indications for 1959

The theoretical factor of confidence is of course important in considering the economic future. Confidence, however, is generally based upon good solid facts rather than on abstract reasoning. Consequently, it appears necessary to survey 1959 on the basis of reasonably well determined statistical concepts.

The area of heaviest consumer resistance during 1958 was in consumer durables. It was the appliance field, the automobile market, and the television industry where consumers reduced their expenditures from the 1957 peak by almost four billions of dollars. Much of the decline occurred early in the year and reliable estimates indicate that a considerable return to buying was made toward the end of the year.

This same situation should continue on into 1959 and, in fact, should improve measurably. Such products face obsolescence, and the usual consumer relinquishes the product long before it actually wears out.

Automobiles should be a prime mover in the sales upsurge during the coming year. The extremely poor results of 1958 plus the indicated interest of consumers in 1959 models portends a good increase in automotive sales.

If any credence can be given to industry forecasts, the dollar value of consumer durable sales for 1959 should be in excess of forty billion dollars, a comfortable increase even over 1957.

Although consumer non-durables had a banner year, they too should surpass 1958 results by a healthy margin. In all probability such items should register sales in the neighborhood of one hundred and fifty billion dollars. For reference, the actual 1957 sales results for non-durables totaled only about one hundred thirty-eight billions.

Service sales should continue to rise also, if only because of creeping inflation and the higher costs of doing business.

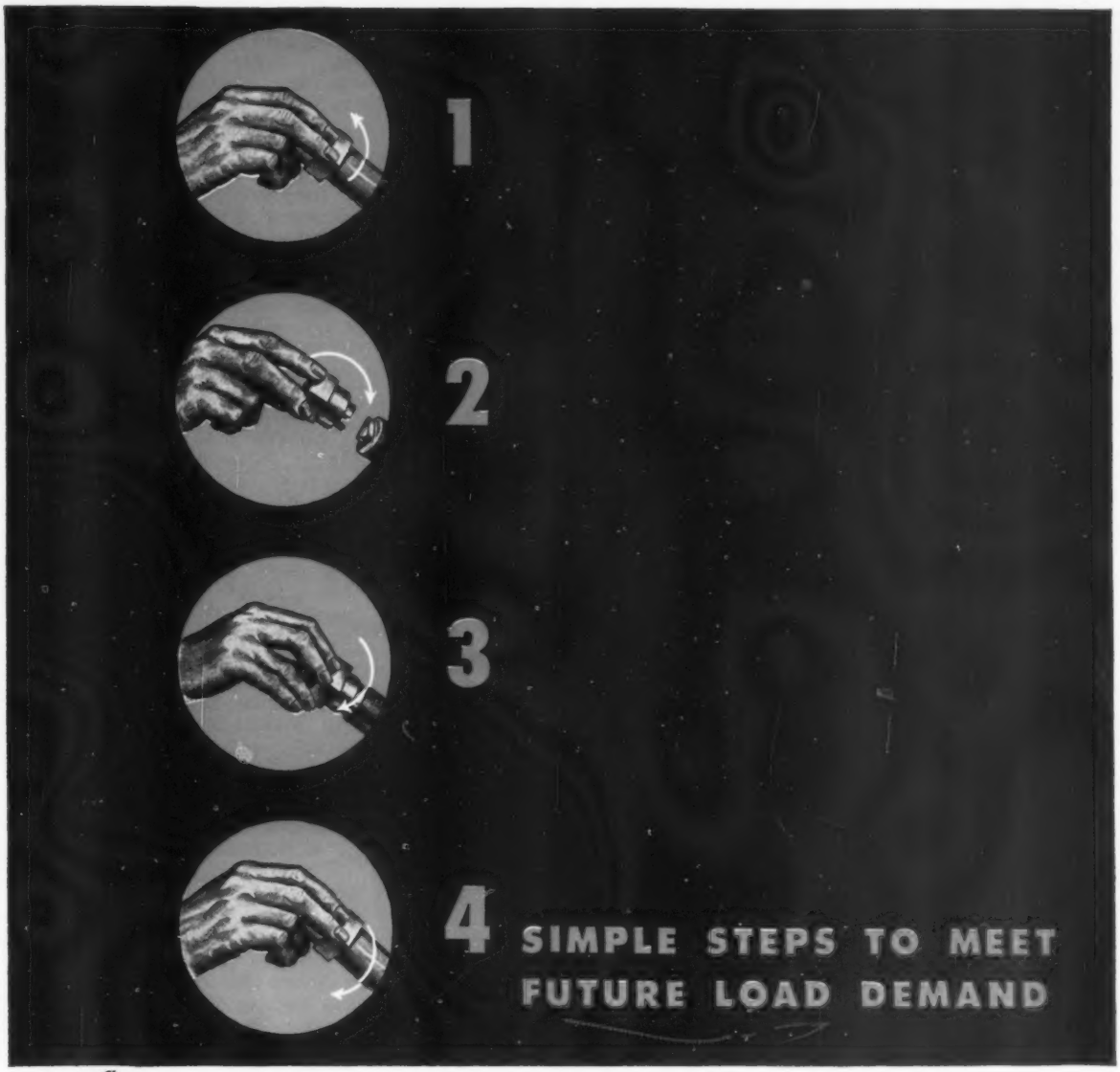
Income and savings

There is no reason to believe that personal income will decline in 1959. Rather it should continue to increase during the year to about three hundred and seventy-five billions of dollars. This would be approximately twenty-five billion over the actual figure for 1957.

It must be recognized that much of this continued rise is due to already negotiated labor contracts that have built-in escalator clauses to take account of rising price levels and higher costs of living. Although industry has made sporadic attempts to hold the wage and salary line, results have not been too promising.

One of the better economic stimulants, however, should be a slight reduction of personal savings. During 1958, with the general uncertainties of economic affairs, many persons saved at more than the normal rate and also reduced heavily the amount of installment debt outstanding.

Both of these trends should be reversed during the ensuing year so that consumer purchases may climb to new heights. If this does happen, then the business picture may reflect even greater optimism than presently predicted with 1959 smashing all economic records in United States history.



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Washington report

By Jack James

Digest of Washington news of special interest to the electrical industry

Record construction in '59—Electrical contractors will take part in the biggest construction year in U. S. history if predictions by economists in the U. S. Departments of Labor and Commerce at Washington prove true.

These economists forecast that contractors for the first time will construct more than $50 billion worth of buildings, houses, highways, etc. The exact figure is $52.3 billion. Estimated figure for 1958 is $48.8 billion.

According to these economists, contractors will put up private construction worth $35.2 billion ($1.4 billion more than in 1958) and $17.1 billion in public construction ($2.1 billion more than in 1958.)

Here are some of the predictions:

Contractors will start 1,175,000 private non-farm dwelling units and 25,000 public. The total, 1,200,000, is 30,000 greater than the total estimated for 1958. Gains reflect commitments made under 1958 easy-money policies.

Contractors will erect $2.1 billion worth of manufacturing plants, $0.4 billion below the 1958 estimate.

They will construct $3.6 billion worth of commercial buildings, the same amount as estimated for 1958.

Their construction for public utilities will be valued at $5.2 billion, $0.2 billion less than estimated for 1958.

And they will lay highways across the face of the nation costing $6 billion, $0.7 billion more than in 1958.

Electricians' safety record good—Electricians have the second best safety record in the construction trades according to the latest figures of the Bureau of Labor Statistics, U. S. Department of Labor.

Their injury rate was 25.7 injuries per million hours worked in 1957. Only the painters had a better record.

The average injury rate for all types of construction in 1957 was 30.3, 0.9 below the 1956 rate. The rate has been declining steadily since 1950.

Roofers and sheet metal workers had the highest injury rate, 39.8 injuries per million hours worked.

Illegal hiring methods hit—Electrical contractors had better make sure that their union hiring arrangements are legal. The National Labor Relations Board has begun cracking down.

The first penalty under the Board's new policy was assessed against a Los Angeles Teamsters local and trucking firm. According to the Board a casual employee bypassed the union to get a job. The union told the firm that it would have to drop the employee; the firm did.

It is all right for the union to have the exclusive right to refer employees to employers, the Board says, but any such arrangement must contain these three elements:

Non-discrimination on the basis of union membership.

Right of the employer to reject any applicant.

And posting of hiring conditions in the hiring hall.

In the Los Angeles case the Board decided that the hiring arrangements did not contain these elements. The Board ordered that the employer and the union *jointly* reimburse *all* casual employees dues paid the union during a six-month period.

When necessary, the Board can also order payment of wages lost because of discrimination.

Journeymen's pay rates rise—Electrical contractors are paying their union electricians an average hourly rate that is 5.8 per cent or 20.3 cents an hour higher than in October 1957, the Department of Labor reports. Average rate is now $3.71 an hour.

The Bureau made a survey of rates paid in 100 major U. S. cities. Highest pay for electricians is at Pittsburgh where employers give $4.35 an hour plus three per cent for insurance and four per cent for pensions. Lowest rate paid is at Burlington, Vt., $2.37½.

Here are the rates in 26 large Southern cities:

Atlanta, $3.50*; Baltimore, $3.57½* plus 7½ cents for insurance; Birmingham, $3.42½*; Charleston, $3*; Charlotte, $2.90*; Chattanooga, $3.40*; Columbia, $2.85*; Dallas, $3.37½* plus 7½ cents for insurance; El Paso, $3.45*; Jackson, $3.15*; Jacksonville, $3.65*;

Knoxville, $3.28*; Little Rock, $3.25*; Louisville, $3.55* plus 7½ cents for insurance; Miami, $3.50* plus five cents for insurance; Mobile, $3.52½* plus ten cents for insurance; Nashville, $3.17½* plus 7½ cents for insurance; New Orleans, $3.47½* plus 7½ cents for insurance; Norfolk, $3.30*; Raleigh, $2.62½*; Richmond, $3.15*;

San Antonio, $3.37½*; Savannah, $3.35*; Shreveport, $3.47½*; Washington, $3.90* plus ten cents for insurance; and Wilmington, $3.82½* plus ten cents for insurance.

* One per cent for pensions.

Supreme Court bans deductions—U. S. Supreme Court Justices ruling 6 to 3 have denied workers the right to deduct from their income taxes their living expenses while indefinitely away from home.

The case brought by three North Carolina construction workers had the backing of the building trades unions. The three were James E. Peurifoy, a welder of Kure Beach, N. C., and Paul V. Stines, a plumber, and John S. Hall, a welder, both of Raleigh.

In their 1953 returns they sought to deduct expenses for subsistence and quarters while helping construct a plant at Kinston, N. C. They worked there for periods of 8.5, 12.5 and 29.5 months.

The Justices thought these periods "indefinite." (Had the periods been temporary, deductions would probably have been allowed.)

In a sharp dissent Justice William O. Douglas contended that the ruling was "harsh" and that it meant that "the taxpayer who is forced to travel from place to place to pursue his trade must carry his home on his back regardless of the fact that he maintains his family at an abode which meets all accepted definitions of home."

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NECA, North Texas Chapter. C. E. Wann, Manager, Westchester House, Apt. 102, 554 South Summit, Fort Worth, Tex.

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NECA, South Texas Chapter. Frank R. Stewart, Manager, 774 East Locust St., San Antonio 12, Tex.

NECA, Rio Grande Valley Chapter. R. N. Cummings, Manager, 607 West 4th St., Weslaco, Tex.

NECA, Virginia Chapter. Richard T. Smouse, Manager, 203 Roslyn Hills Dr., Richmond 26, Va.

NECA, West Virginia-Ohio Valley Chapter. Richard G. Dye, Manager, 510½ C St., South Charleston, W. Va.

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NISA, Southeastern Chapter. Mrs. Virginia Oehmann, Executive Secretary, 19 N. W. Fifth St., Fort Lauderdale, Fla.

NISA, Electric Motor Service Association of the District of Columbia. John W. Leinhart, Secretary, 913 E. St., NW, Washington 4, D. C.

NISA, Louisville Chapter. W. C. Krauth, Secretary, 118 S. 1st St. Louisville, Ky.

NISA, New Orleans Chapter. William Dreis, Secretary, 1517 Calliope St., New Orleans, La.

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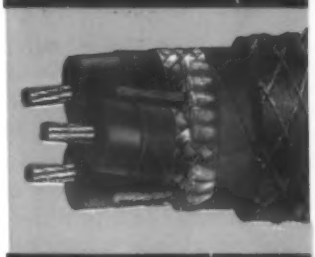

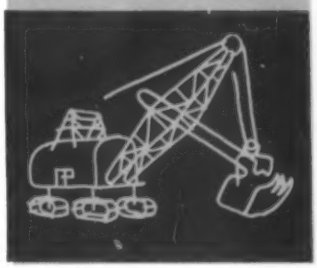

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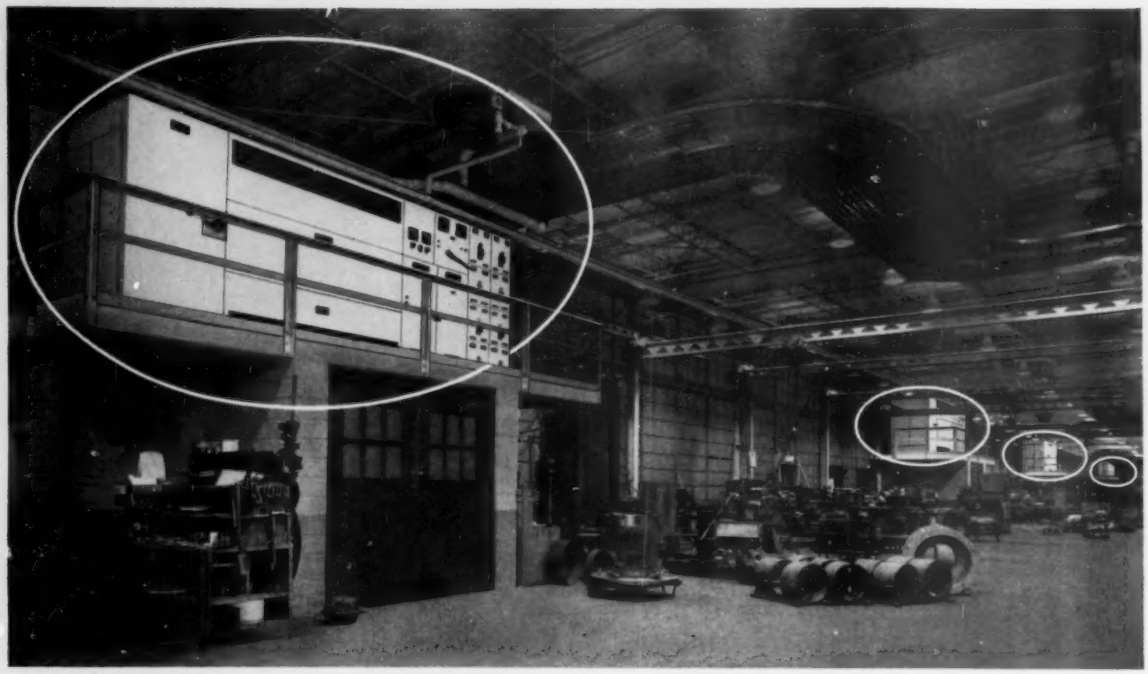

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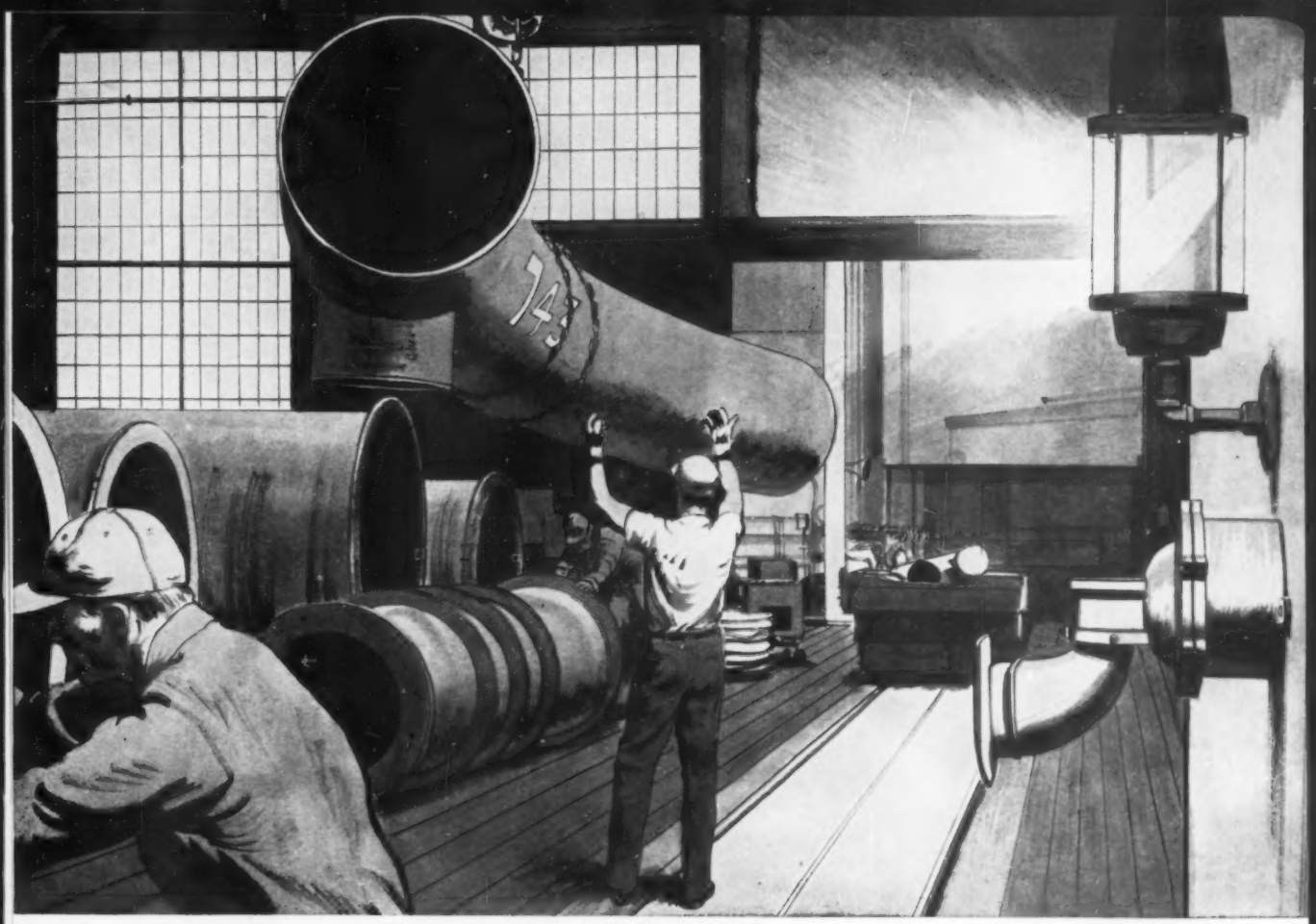

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compact design reduces weight 60%

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The entire line of Allis-Chalmers potential transformers, from 24 kv through 230 kv, can withstand long voltage stresses and short-time surge conditions. Internal corners and coil edges are protected by formed insulating channels which fit close to coil surfaces — effectively prohibiting formation of corona and the development of leakage paths. The one-piece high voltage porcelain bushing, integral with the primary winding, incorporates the same corona-free design features used in the transformer.

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There are many satisfactory copper connectors for connecting copper conductors.

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Blackburn's PAC clamps combine the features of a good copper connector and a good aluminum connector to give you the best copper to aluminum connector available.

Our exclusive method (Patent applied for) of pressure casting molten corrosion resistant aluminum alloy around specially treated pronged copper liners establishes an intimate, low resistance contact of the two metals without using corrosive solder.

The copper liners, which cannot be mated incorrectly, surround the copper conductor establishing a good copper to copper contact.

The aluminum grooves surround the aluminum conductors, establishing a good aluminum contact.

Adequate contact surface and conductor separation is built into Blackburn's PAC clamps to insure long-lasting, trouble-free copper to aluminum connections without setting up cold flow or galvanic corrosion.

Spring action is inherent in the design of PAC clamps and is supplemented with an extra-heavy spring lockwasher insuring permanently tight connections which will withstand temperature fluctuations.

Hot dipped galvanized steel hardware is standard. Aluminum hardware available on all but Catalog #PAC-3.

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LIGHTING CONTROL—The Arrow-Hart and Hegeman Electric Co., 103 Hawthorn St., Hartford 6, Conn., offers a one-page information sheet on their new quiet, tap action, lighting control switch, designed to fit any standard toggle wall plate.
Write in No. A100 on card, Pg. 19

FITTINGS AND FIXTURES — A 32-page illustrated catalog covering Killark fittings and fixtures is offered by Killark Electric Mfg. Co., Vandeventer and Easton Aves., St. Louis 13, Mo.
Write in No. A101 on card, Pg. 19

ELECTRICAL BOXES—Steel City Electric Co., 1207 Columbus Ave., Pittsburgh 33, Pa., offers a catalog of their complete line.
Write in No. A102 on card, Pg. 19

GUY STRAND — An Engineering Data Sheet—E. D. 1878—describing the new Copperweld Type M Guy Strand. Contains table of physical properties as well as instructions for dead-ending this new high-strength, non-rusting guy strand. Available from Copperweld Steel Company, Frick Building, Pittsburgh 19, Pa.
Write in No. A103 on card, Pg. 19

ELECTRICAL FITTINGS — A 40-page illustrated catalog and price list on the Gedney line. Shown and listed are conduit, threaded entrance, SEC, EMT and ground fittings and box connectors for both armored and non-metallic cables. Copies are available from Gedney Electric Co., RKO Bldg., Radio City, New York 20, N. Y.
Write in No. A104 on card, Pg. 19

CONSTRUCTION ANCHORS—"Anchoring for Power and Communication Lines," a completely illustrated manual on improving line construction with better anchoring, has been published by the Advertising Dept., the A. B. Chance Co., Centralia, Mo. The 25-page booklet shows how to install the right anchor at the right place in the right way.
Write in No. A105 on card, Pg. 19

SERVICE PANELS — Information on protective electrical control centers for homes, apartment buildings, service stations, and industrial applications is contained in Bulletin PM-385, "BullDog Pushmatic Electric-Centers," issued by BullDog Electric Products Co., 7610 Jos Campau, Detroit, Mich.
Write in No. A106 on card, Pg. 19

ELECTRICAL FITTINGS — Blackhawk Industries, Dubuque, Iowa, offers a complete catalog of electrical conduit and cable fittings. Also a special publication giving detail drawings and instructions for installing service entrance masts on low or ranch type buildings.
Write in No. A107 on card, Pg. 19

WIRE PULLING LUBRICANT — Illustrated six-page folder showing the advantages of an improved Y-Er Eas wire pulling lubricant is available from Electro Compound Co., 4145 W. 150th St., Cleveland 11, Ohio.
Write in No. A108 on card, Pg. 19

GENERAL CATALOG — General catalog of Royal Electric Corporation, Pawtucket, R. I. covering flexible, service and lamp cords, cord sets, extensions, trouble lights, wiring devices and fuses is available to wholesalers. Dealer catalogs may be secured from Royal distributors.
Write in No. A109 on card, Pg. 19

CARBON PRODUCTS—A 28-page catalog on Motor and Generator Brushes and carbon products telling how to order brushes, grade recommendations, characteristics, and description of brush grades, is available from the Helwig Co., 2536 North 30th St., Milwaukee, Wis.
Write in No. A110 on card, Pg. 19

POWER BENDER — The lightweight hydraulic power bender #884, manufactured by Greenlee Tool Co., of Rockford, Ill., is described in a new bulletin issued by the company.
Write in No. A111 on card, Pg. 19

CABLE SPINNERS — A complete data file on aerial cable spinners and tools is available from Cable Spinning Equipment Co., 3100 Topeka Blvd., Topeka, Kansas. The file includes reprints of pertinent articles, operating instruction book, and price list.
Write in No. A112 on card, Pg. 19

ELECTRICAL EQUIPMENT — The Wadsworth Electric Mfg. Co., Inc., Covington, Ky., has issued a new catalog Con 15-0 and Bulletin W. C. B. 53-1, containing data on their lines of Safety Switches, Service Equipment, Distribution Panels and "E-Z-RED" Circuit Breakers.
Write in No. A113 on card, Pg. 19

COMPRESSION CONNECTORS — An illustrated 18-page bulletin (13A) describes Squeezon compression connectors for all overhead distribution connections from line wire to ground rod. Offered by James R. Kearney Corp., 4236 Clayton Ave., St. Louis 10, Mo., the bulletin also describes the mechanical and hydraulic installation tools required and tells where to use each.
Write in No. A114 on card, Pg. 19

SELECTING FUSES — A 12-page descriptive handbook "Fuseology tells how to get safest most dependable, trouble-free electrical protection from fuses. Contains useful information on selecting right size and type of fuses —how to stop needless blows—avoiding poor contact and other troubles. Issued by Bussmann Mfg. Co., University at Jefferson, St. Louis 7, Mo.
Write in No. A115 on card, Pg. 19

WIRE AND CABLE—Simplex Wire & Cable Co. announces a new catalogue of the family of ANHYDREX insulated cables. Catalogue No. 1028, which supersedes Nos. 1017 and 1018, is available on request from Simplex Wire & Cable Co., 79 Sidney Street, Cambridge 39, Mass.
Write in No. A116 on card, Pg. 19

LIGHTING FIXTURES—The Perfeclite Co., 1457 East 40th Street, Cleveland 3, Ohio, makes available the following literature: (1) Data Folder 54-B — 4 pages of engineering information, prices and specifications on Plastic Indirect Concentric Ring Luminaires. (2) Data Folder EX-57—10 pages of information on Exit Units for all building locations. Complete Engineering data and prices given. (3) Data Folder 56-A — Information on Ceiling Pan Fixtures and Vapor Proof Prismatic Exterior Fixtures. (4) Data Folder 58-A on Concrete Mounting Boxes for recessed incandescent units. (5) Data Folder 58-B on Fluorescent Exit Units. (6) Data Folder 58-C on Phosphorescent Exit Units. (7) Data Folder 57-A on extra shallow recessed units and square ceiling pans.
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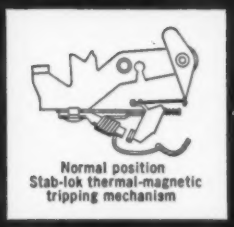
new Stab-lok magnetic coil trips breaker in 1/120 second for surest short circuit protection... including lamp and appliance cords!



Frayed, worn lamp and appliance cords can cause dangerous short circuits. To provide maximum protection under these conditions, a new magnetic coil tripping mechanism has been added to type NA STAB-LOK breakers. This feature now brings the same, proved thermal-magnetic STAB-LOK protection to lamp and appliance cords... trips breaker in ½ cycle to open circuit almost instantly. For details about the complete STAB-LOK line, write for Bulletin 1-125, Federal Pacific Electric Company, General Offices: Dept. 263, Newark 1, New Jersey

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METAL-CLAD SWITCHGEAR — Detailed information on metal-clad switchgear is now available in two special bulletins, 700-B and 7004-C. These booklets give descriptions, application data and specifications on units up to 15 kv and 500,000 kva interrupting capacity. Wire I-T-E Circuit Breaker Co., 19th and Hamilton St., Philadelphia 30, Pa.

Write in No. A118 on card, Pg. 19

ELECTRICAL ENCLOSURES — Catalog No. 5354 currently being offered to the trade by B & C Metal Stamping Co., 590 Means St., N. W., Atlanta, Ga., is a well-organized compact 94-page manual giving complete descriptive information, prices, and specifications on all items in the B & C line of electrical enclosures. Copies are available free of charge to electrical contractors.

Write in No. A119 on card, Pg. 19

ELECTRICAL FITTINGS—Concise 36-page catalog illustrates and describes a complete line of electrical fittings, cable racks and wiring specialties. The catalog contains many detail drawings, clear-cut photographic illustrations of mast fittings, cable connectors, straps, hangers and ground clamps in a wide variety of types and sizes. For your free copy, write The M. &. W. Electric Mfg. Co., East Palestine, Ohio.

Write in No. A120 on card, Pg. 19

CABLE CONNECTORS — Tomic Sales and Engineering Co., 20000 Sherwood Ave., Detroit 34, Mich., now have available catalog sheets containing data on the complete line of their connectors, couplings, and cable connectors.

Write in No. A121 on card, Pg. 19

WIRING DEVICES — A complete new catalog of wiring devices is now available from Bell Electric Co., 5735 S. Claremont Ave., Chicago 36, Ill. The line includes a wide range of weatherproof receptacles and switches, portable garden lights, wall plates, and specialty items.

Write in No. A122 on card, Pg. 19

LIGHTING FIXTURES — A new completely detailed Catalog showing the latest in Indoor and Outdoor Lighting and Luminous Ceilings available from Sta-Brite Fluorescent Mfg. Company, Box 291, Riverside Sta., Miami, Fla.

Write in No. A123 on card, Pg. 19

PLUG-IN REELITE — Complete details about Appleton's lightweight, portable automatic Reelites are given in an attractive 4-page catalog insert. These devices find application in a wide range of occupancies: garages, loading docks, garment industry, construction crews, warehouses, machine shops, etc. Write to Appleton Electric Co., 1701 Wellington Ave., Chicago 13, Ill.

Write in No. A124 on card, Pg. 19

CONVENIENCE OUTLETS—Bulletin gives complete information on the new P&S No. 500 for adding extra outlets to existing installations. Everything you need in a single package—no steel boxes required. Available from Pass & Seymour, Inc., Dept. ES, Syracuse 9, N. Y.

Write in No. A125 on card, Pg. 19

FLUORESCENT BALLASTS—Advance Transformer Co., 2950 N. Western Ave., Chicago 18, Ill., has recently completed the compilation and printing of a 20-page catalog on fluorescent ballasts and their use. Included are data sheets on available Advance ballasts and a comprehensive installation and operation section and testing procedures. Copies of the booklet are available on request.

Write in No. A126 on card, Pg. 19

FLUORESCENT FIXTURES—Catalog folder No. 911, "Peerlite by Guth," has been announced by the Edwin F. Guth Co., 2615 Washington Blvd., St. Louis 3, Mo. Copies of this new eight-page booklet are available from the company upon request. The booklet is designed for the lighting specialist, giving complete engineering data and dimensions.

Write in No. A127 on card, Pg. 19

WIRING DEVICES — Catalog No. 56, and New Product Bulletins, containing the complete electrical wiring device line of Leviton Mfg. Co., Inc. Brooklyn 22, N. Y. Over 100-pages accurately illustrated and containing electrical and circuit wiring diagrams. Complete cross index for easy reference. Featured are Specification Grade Devices, Interchangeable line, Lev-O-Lock line, and many, many others; devices for every possible use in Industrial, Commercial and Residential applications.

Write in No. A128 on card, Pg. 19

ELECTRICAL CONDUITS—"Natural Electric Conduits" is the title of the 30-page Catalog No. 603 which describes and illustrates the many types of electrical conduits that are manufactured by National Electric Products Corp., 2 Gateway Center, Pittsburgh 22, Pa.

Write in No. A129 on card, Pg. 19

LIGHTING FIXTURES — Prescolite Manufacturing Corp., 2229 Fourth St., Berkeley 10, Calif., now has available a 36-page color catalog, No. 31-F, describing their complete line of lighting fixtures including recessed series and accessories, surface series and accessories, exit light, and aisle lights. Dimensional drawings are shown for each fixture.

Write in No. A130 on card, Pg. 19

ANCHORING DEVICES—An illustrated 32-page catalog, No. 65, describing more than 25 anchoring and drilling devices for making fastenings to masonry, is available from the Arro Expansion Bolt Co., Marion, Ohio.

Write in No. A131 on card, Pg. 19

CONNECTORS — Comprehensive, up-to-date information on electrical connections for overhead lines in transmission and distribution is now available in one convenient publication, a 100-page manual issued by Burndy Corp., Norwalk, Conn., on connection techniques, connectors, and installation tooling.

Write in No. A132 on card, Pg. 19

CONDUIT FITTINGS — A new complete 24-page catalog illustrating their complete line of conduit fittings and lighting parts for the electrical wholesaler has been made available by Elliott Electric Products Co., 1513 Olmstead Ave., New York 62, N. Y.

Write in No. A133 on card, Pg. 19

SWITCH AND OUTLET BOXES—A new RACO General Catalog is now available listing detailed information on boxes, covers, and bar hangers. The catalog includes data on numbers of wires permitted per box and a list of comparative catalog numbers. Copy available from All-Steel Equipment, Inc., Aurora, Ill.

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Add Value to Your Kitchens with these Low-Cost...

NuTone Built·Ins

Kitchen in Ceramic Tile by Suntile . . RCA Whirlpool Range and Oven . . NuTone Food Center in counter . . NuTone Intercom-Radio and Clock Chime on wall.

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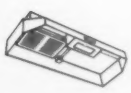

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Electrical South

806 PEACHTREE ST., N. E.

ATLANTA 8, GEORGIA

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Electrical South

806 PEACHTREE ST., N. E.

ATLANTA 8, GEORGIA

Outdoor lighting at Del Webb's HiwayHouse Hotel, Phoenix, Arizona, comes on automatically at night, goes off in the morning. Underground wiring is protected by 3200 ft. of SPANG HD Galvanized Conduit in this seven-acre patio. Hotel has 250 rooms, can accommodate 650 guests.

SPANG Conduit Protects HiwayHouse Hotel Wiring

"We want to maintain our record for quality installations," says Mr. Ernest E. Cannon. "Therefore we always use dependable, durable materials. That's one reason why we use SPANG Conduit regularly."

At the $3 million Del Webb HiwayHouse Hotel, one of Phoenix, Arizona's newest and most attractive inns, over 6,800 ft. of SPANG Galvanized Conduit serves elaborate outdoor lighting, indoor power requirements and telephone lines to all rooms.

SPANG Conduit helps maintain rush schedule

Mr. Ernest E. Cannon, owner of Cannon & Wendt Electric Company in Phoenix, says: "The contractor's schedule called for speedy construction. Because SPANG Conduit is easy to work with, there was no delay in making this installation. Bending was fast and accurate; the excellent hot-dipped galvanized finish took even the severest bends with no trouble."

Conduit serves many purposes

Buried underground, SPANG Conduit protects automatic outdoor lighting that illuminates swimming pool, trees, shrubs, parking lot, buildings and patio. Inside, all lighting, air conditioning, food preparation and phone system wiring is carried by conduit runs in ceilings and walls.

Make SPANG your first choice

It's *quality-controlled* during manufacturing, and tested and inspected to provide you with *top-quality* conduit every time. Your local SPANG Distributor carries the complete line of conduit and fittings. Let him serve you on your next job.

Architect: Victor Gruen, New York, N.Y.

General Contractor: Del E. Webb Construction Company, Phoenix, Ariz.

Electrical Contractor: Cannon & Wendt Electric Company, Phoenix, Ariz.

SPANG Distributor: Brown Wholesale Electric Company, Phoenix, Ariz.

SPANG® CONDUIT

THE NATIONAL SUPPLY COMPANY

Subsidiary of Armco Steel Corporation

TWO GATEWAY CENTER, PITTSBURGH, PA.

Electric industry records stability,

J. E. Corette
President
Edison Electric Institute

◆ OUTSTANDING among the encouraging influences during the 1957-1958 recession were the stability and progress of the electric utility industry.

While industrial production, as measured by the Federal Reserve Board, declined over 19 points, electric production more than held its own. Generation by all components in the industry totalled 641 billion kwhr, an increase of 10 billion kwhr over 1957.

Railway and industrial generation declined slightly in 1958, however, so when the combined output of these plants is added to that of the electric industry, total electric production for the nation in 1958 reaches 721 billion kwhr. This exceeds last year's figure by 5 billion kwhr.

Built-in stabilizers

The electric industry has some built-in stabilizers, the most prominent being constantly increasing residential use per customer and the constant increase in number of customers. In 1958 average annual usage of electricity per domestic customer reached another new high of 3,385 kwhr. This represents an increase of 211 kwhr over last year. The striking long-term growth in this sector of electricity consumption in the U. S. is plotted in Chart 1 which shows average annual usage by rural and residential customers since 1937. The persistent and consistent way home kilowatt-hour consumption has increased, during all phases of business activity, is striking.

The electric industry added another million customers in 1958, bringing the total at year end to 56.2 million. Over 85 per cent of these additional customers are residential. This is an accurate reflection of the growth of our nation. Population estimates predict a figure of over 200 million persons in less than ten years hence. These new citizens, as well as those of us presently here, will create still greater demands for all our nation's products, including electricity. The electric industry expects residential demand to keep to its current trend, and use of from 6,000 to 8,000 kwhr per domestic consumer per year by 1968 is not an idle speculation.

Because of the three years "lead time" required to get new power-producing facilities ready for use, the electric industry must plan well ahead of customer demand. Temporary business declines cannot cloud the industry's long-term vision. In 1958, for example, the investor-owned companies spent $3.8 billion on new plant and equipment investment, an increase of $100 million over the 1957 record high. With total business investment (all industries) declining in 1958, from $37 to $31 billion, the investor-owned electric companies' confidence in the nation's future greatly helped to prop up this key component in our over-all economy.

Electric plant investment equalled 12.5 per cent or one-eighth, of all business investment in 1958. In 1958 the electric industry made the largest annual single increase in generating capability in the industry's history.

New generating equipment

Fourteen million kw of new generating equipment came on the line in 1958. Of this amount 11.5 million kw were added by the investor-owned electric companies and the remainder by governmental agencies. The new additions increased America's electric utility generating capability to 149.5 million kw at year-end 1958. By way of comparison, more kilowatts of generating capability were added than the industry had in operation in 1920, or again, 1958's additions approximate the amount added from 1945 to 1949, a period of five years.

The electric industry expects to keep right on adding to America's power supply. Construction expenditures by electric companies in 1959 are expected to equal the $3.8 billion expended in 1958 on new plant and equipment. About 13.6 million more kilowatts of capability will be brought into service in 1959; 10.2 million by the companies, and 3.4 million by governmental agencies. In ten years the electric industry is expected to be adding over 20 million kw a year just to keep abreast of a con-

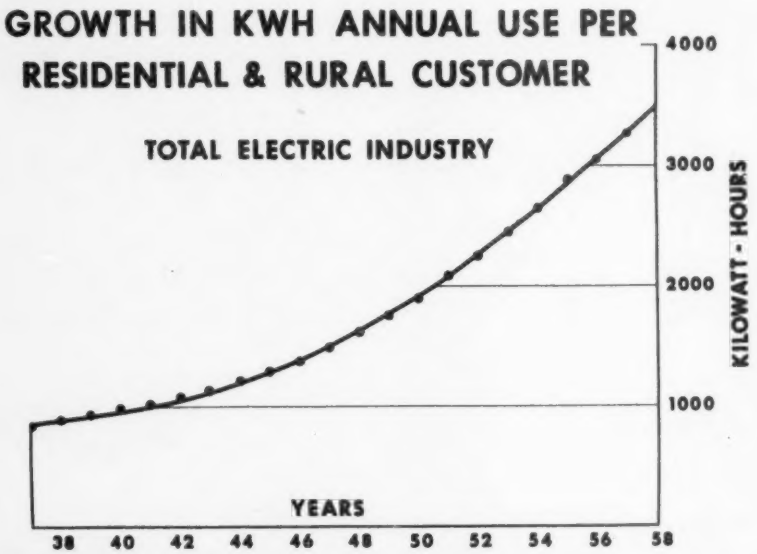


Chart 1—The striking long-term growth (1938-1958) in the usage of electricity by rural and residential customers in the United States.

progress during 1957-1958 recession

sumer demand estimated at 1,300 billion kwhr for the year 1968.

Revenues up

During the recession, total corporate profits of all industries suffered one of the sharpest declines in history—dropping 30 per cent. However, earnings of the nation's investor-owned electric companies as a whole were better than in 1957. Gross revenues in 1958 were $8,416 million; in 1957 they were $8,054 million. Net income was $1,534 million in 1958 versus $1,427 million in 1957.

A growth industry, such as the electric industry, with considerable insulation from the fluctuations of the business cycle, is important to investors—of which there are presently nearly 4 million—to employees and to customers.

During the recent business decline, compensation to all employees in all industries fell off about 2 per cent. But in the electric utility industry wage and salary compensation ran up from $1,426 million in 1957 to $1,490 million in 1958, an increase of almost 5 per cent. Steady jobs at good pay is an important factor in retaining the reliable and dedicated personnel necessary in the electric utility industry.

Fuel, another important expense, cost power companies $1,365 million in 1958, a 1.2 per cent decrease from 1957. Due to favorable water conditions throughout the country, hydro generation accounted for a larger share of total electric utility generation. In 1957, falling water sources generated 20.6 per cent of the total, whereas in 1958 hydro generation was estimated at 22.1 per cent of the total.

Investor-owned electric companies will pay approximately $2 billion in taxes for 1958, up over the previous year's total by nearly $150 million. These payments to all levels of government, Federal, State, and local, represent a fantastic figure when it is considered that an equal amount was paid by all the 48 state governments for unemployment benefits to more than 3½ million unemployed workers during the year.

One of the reasons behind the anticipated $12.5 billion Federal deficit this year is the lower tax payments from recession-hit corporations. Had utility net income decreased, the Federal deficit would be even higher. Considering the plight of government finances, it appears not only discriminatory but irresponsible to continue the preferred tax position of government-owned and government-financed power projects. Customers of government power, as more and more people are beginning to realize, do not pay their fair share of our national tax burden.

Electricity cost

Despite the recession, the Consumers' Price Index moved to a high of 123.9 in July 1958 (1947-49 = 100). In contrast, the average revenue per kilowatt-hour sold to domestic customers maintained its steady decline. In 1958 average revenue was 2.52 cents, down from 2.56 cents in the previous year. Increased consumption, the promotional character of electric rates, as well as operating efficiencies, have all contributed to this enviable record.

Latest available figures show that of each dollar spent by consumers, only 1.32 cents went for electricity, whereas 2.13 cents were spent for tobacco, 3.00 cents for gasoline and 5.18 for recreation.

Regulatory Commissions continue to recognize the inflationary inroads on practically all aspects of operational and capital costs, and the necessity for the financial strength essential to the provision of adequate electric service.

From 1946 through the first 11 months of 1958, according to tabulations of the Edison Electric Institute, there were 542 applications for rate increases, involving 220 companies. Of the 542 applications, 476 were granted, 32 are pending, 13 were withdrawn, and 21 denied. The 1958 record to December 1 shows 58 actions. Thirty increases were granted, 27 of the 1958 applications are still pending, and one was denied.

Electrical living program

The Edison Electric Institute Board of Directors in 1958 approved an Institute-sponsored National Electrical Living Program aimed at further increasing the

(Continued on page 105)

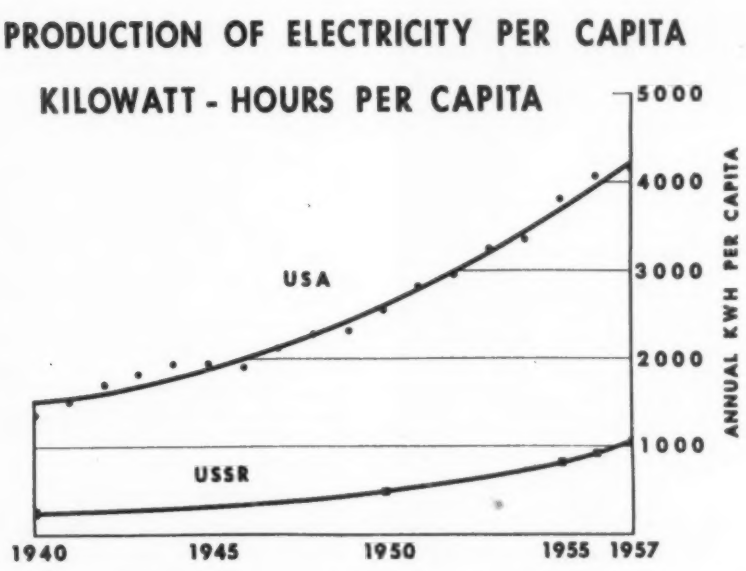


Chart 2—Comparison of growth in production of electricity per capita under free enterprise economy (USA) and controlled economy (USSR).

A custom-built modern home

In this contemporary styled house the living-dining area is almost enclosed by glass and does not permit conventional wiring. There is no space to work in the walls and no way to bring wire up and over.

In the kitchen, tubing was run under the floor and stubbed up into locations of stoves and ovens. A waterproof type wire was used.

By S. W. Osmundson

Severin W. Osmundson
Electrical Construction
Wheaton, Md.

This article should be especially helpful to the following readers:

- Electrical Contractors ✓
- Electric Utilities ✓
- Electrical Wholesalers ✓
- Electrical Inspectors
- Industrial Engineers
- Consulting Engineers ✓

◆ THE CUSTOM-BUILT home of modern design presents new problems for the electrical contractor. Contractors who have been called on to install wiring systems in homes where an open-type ceiling and entire walls of glass paneling leave no room for routine wiring procedures will recognize at once the construction described here.

The home presented on this page, selected by *House and Garden* as one of the homes of the year in design, planning, and equipment, typifies the modern design residence requiring a new approach to wiring. There is no space to work in the walls and no way to bring wire up and over. The contractor is also limited by the architect's specific conditions for preserving design, appearance, and convenience.

This contemporary styled house of 3,400 sq. ft. of living space on three levels has an all-electric kitchen, air conditioning, and inter-communication telephone system. The living-dining area was almost completely enclosed by window walls and sliding glass doors, and therefore there was no way of bringing wire up and over. We had to go down under the floor. We ran tubing under the floor and stubbed up into locations of stoves and ovens, using TW type wire.

Outlet receptacles

The architect's plans also called for outlet receptacles cut back into the baseboard of the walls and recessed. We solved this problem with a special plastic outlet strip

presents new wiring problems

mounted against the wall (see illustration). The architect further specified he did not want a boxplate in the wall. This posed another problem. A normal gymbox would not work on a three-inch baseboard. Recalling that doorswitches had to have boxes too, we ordered a special doorswitch box and recessed it in the wall and cut the plate down to the width of the outlet strip.

A box would have taken the entire baseboard. This way we did not have to notch the 2 x 4 plate. Our solution was perfect under the circumstances and also met Code regulations. When we found this box adaptable to our conditions, we special ordered them.

In this home recessed lighting was specified over the basins in bathrooms, and incandescent light was preferred to fluorescent. Four lights were to be placed in each recessed ceiling area of the bathroom. Normally an 8B box would have been put in with a porcelain socket. With a Bulldog strip, however, we thought as many plugs as were needed could be put in. We put a light socket in each plug. This saved individual boxes, and avoided the unsightly projection of one-and-a-half inches of unnecessary box. A nice lighting job resulted. More lights could be added to the strip without altering anything.

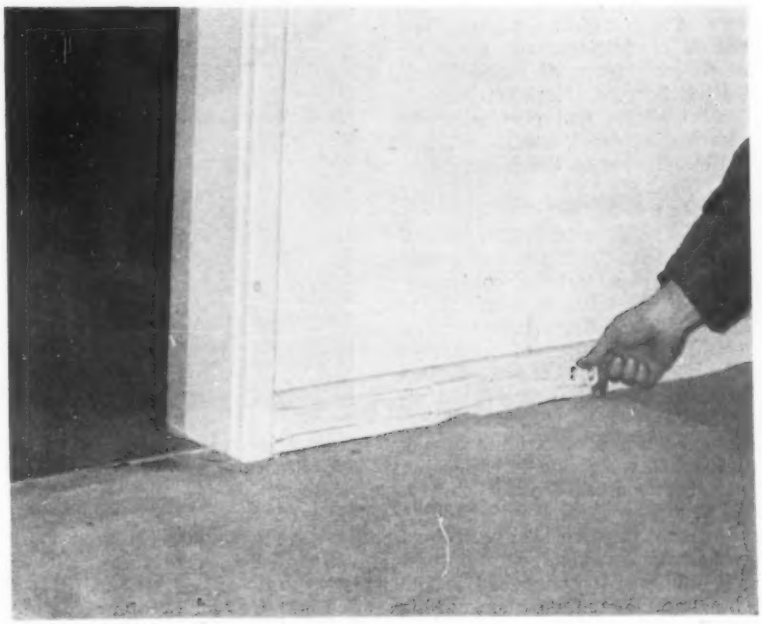
Circuit breaker equipment was used throughout the house. For adaptability in varied situations we have found nothing so ideal.

Wiring for future use

In residential wiring, it is well to anticipate future use, for it is not practical to sell a custom home short on wiring. It may cost a little more, but it will pay off ultimately for the customer in future savings and convenience. The electrician is also spared repeat work. For example, in a good many homes the basement light is wired with one switch control from the first floor, but a home with a basement entrance would be better from the start with a three-way switch. Taking care of such details right in the beginning avoids

(Continued on page 107)

Recessed incandescent lighting over the basins and showers in the bathroom was specified in this electrically modern home.



A baseboard consisting of a plastic outlet strip combined with a metal molding strip provided the required outlet receptacles.

Electricians help sell Medallion homes

By Sophie W. Ellis

This article should be especially helpful to the following readers:

Electrical Contractors ✔
Electric Utilities ✔
Electrical Wholesalers ✔
Electrical Inspectors
Industrial Engineers
Consulting Engineers

◆ WHEN THE FIRST complete Medallion Home subdivision held open house at Little Rock to present 32 homes priced $23,000 to $28,000, there was one striking difference in the way the public was acquainted with the Housepower features that won the bronze medallion decoration for each home.

The electricians who had wired the first home and who were completing the wiring of all other homes in Plaza Terrace helped to receive visitors, talk to them, and explain adequate wiring. Each man possessed some social grace, was neatly dressed, and able to converse freely with anyone. All were the carefully picked and trained electricians who make up the 20-man force of Price-Fewell Electric Service, North Little Rock. Their training had covered more than trade school, special schools, and experience on the job.

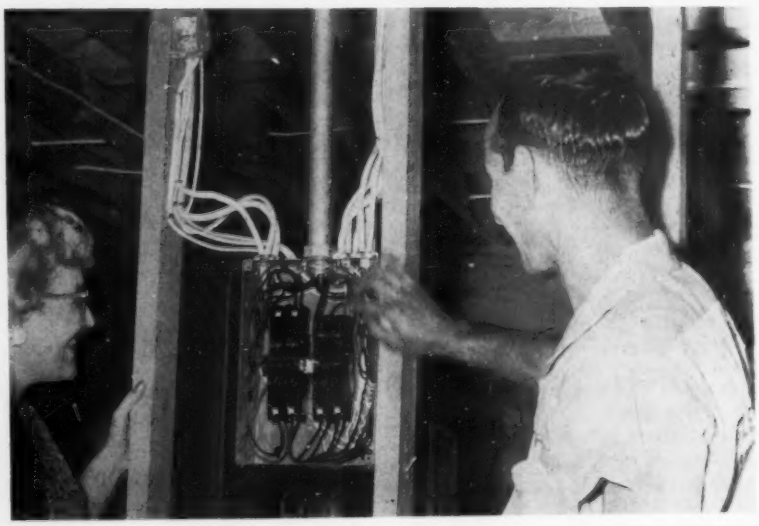
High standards

E. L. Fewell reveals the unusual standards set for his men: "Never before has the electrical contractor and his electricians received so much attention from home owners. People are conscious of quality in wiring. And we feel that Medallion homes should be wired by 'Medallion' electricians. The day of the tobacco-chewing electrician is gone forever. Our boys go to every job with their shoes freshly shined, their hair combed, wearing clean uniforms. They are all high school graduates, of good appearance, and well-equipped to go into a $150,000 home and talk to the owner and his wife."

The builder who promoted Plaza Terrace Medallion homes, Joseph Kaufman, recognized the value of the Live Better Electrically program of the Arkansas Power & Light Co., and cooperated fully in turning public attention on the electricians as well as on adequate wiring, light conditioning, and electrical equipment for modern electrical living. One of the features of the opening program for the subdivision was a partially completed house, with studding and wiring exposed for inspection.

(Continued on page 109)

An electrician explains full Housepower with the aid of exposed wires in the partially completed show house in Plaza Terrace.



Paul Lear, electrician, shows a prospective home buyer the separate circuit installed for each major appliance in the Medallion homes.

Corbett Electric finds outside service calls have many advantages. They establish goodwill; initiate new business; retain old customers; and are the finest form of advertising, providing prices are realistic and eternal vigilance is exercised.

Handling service calls on a profit basis

By Harry J. Miller

This article should be especially helpful to the following readers:

Electrical Contractors ✔
Electric Utilities ✔
Electrical Wholesalers ✔
Electrical Inspectors
Industrial Engineers
Consulting Engineers

◆ "IF THE ELECTRICAL contractor would take the trouble to make a thorough analysis of profit made or losses sustained in taking care of outside service calls, he might find himself unhappy with the results, even if he's getting what he considers a fair flat figure as a service charge."

So says electrical contractor George Corbett, of Bradenton, Fla., who feels that in getting a service department on a sound basis, it pays a contractor to make a study of competitive prices charged by servicemen in his area, not only in his own field, but among the dealers in radio-TV, appliances, plumbing, etc.

The Florida contractor is of the opinion that such a study might shock the electrical man into the knowledge that he has been getting a lot of service calls simply because his charges are less than those of his competitors.

On the other hand, Corbett believes that in attempting to recover all of his costs, the electrical contractor may price himself out of service work, because a surprisingly large number of servicemen do not know their actual operating costs.

But higher charges may accomplish by indirection what the contractor attempts to do directly: eliminate service call losses by discouraging service calls. While service calls made or a higher rate schedule may assure the contractor of breaking even if not returning a profit, Corbett deplores such an approach to this ever-vexing problem.

Good advertising

"We welcome service calls," he says, "because they're more valuable than the best kind of newspaper or classified telephone directory ads. Service calls, properly handled, create goodwill, keep our name in the customer's mind. Very often what started out to be a simple fuse renewal lands us a sale to replace a defective appliance, or winds up in a major revamping of an overloaded or antiquated wiring system.

"After a study of our operations, we decided on a price of $3.50 an hour, plus material, and a free call-back if necessary. Assume that a serviceman leaves the shop, makes the repair, and is back again in 40 minutes. On the face of it we've done all right, because there's a 20 minute margin in our favor. But it is unlikely in practice that more than 7 or 8 calls can be made in a day, especially since many of our customers are in an area where trucks have to travel considerable distances."

Regardless of customer resistance to the $3.50 charge on the grounds that "the serviceman was only here 5 minutes," (Corbett feels the flat fee must be enforced whether the job takes an hour or a small portion of it. Otherwise the contractor is very likely to discover that he is paying his servicemen for an 8-hour day while he is being reimbursed by his customers on the basis of only 5 or 6 hours labor.

"While pricing service calls is by no means uniform among electrical contractors or in the various service trades, the flat fee, irksome as it may be at times, avoids losses on outside calls which could rack up a yearly total staggering to the small contractor," Corbett points out.

Collecting bills

"And," he warns, "it's a mistake to let your serviceman make out and collect the bill on the spot. If he happens to complete the repair in a few minutes and presents a bill for $3.50, especially to a customer whose own earnings per hour are considerably less than our charge, he's likely to start an argument.

"By sending the bill to the customer, your help isn't beguiled by your princely(?) earnings and thus encouraged to leave you and become your competitor. Again, you tie the customer better to your

(Continued on page 107)

Showroom aids homeowners,

J. B. Carson, president, Kingsport Electric, looks over plans for a job with W. K. Stansell, salesman.

Mr. Carson with S. R. Shiver, general manager, looks over their extensive catalog library.

Porter Cherry, service manager, shows a part to a customer. Repair parts are always kept available.

By Warner Ogden

This article should be especially helpful to the following readers:

- Electrical Contractors ✓
- Electric Utilities ✓
- Electrical Wholesalers ✓
- Electical Inspectors
- Industrial Engineers
- Consulting Engineers

◆ "YOU'VE GOT TO take your goods or services to the people these days or they're not going to buy. And you've got to make it easy for them to buy." Speaking from long experience was J. B. Carson, president of Kingsport Electric Co., Kingsport, Tenn.

Mr. Carson, a widely-known past president of the Southeastern Electrical Wholesalers' Association has many successful ideas for helping electrical contractors, dealers, and industrial customers. For instance, he uses a new downtown centrally located corner building, just across from the company's offices and stockrooms for displays of lighting fixtures, kitchen equipment, and various built-in electrical items. Such a showroom is a big help to electrical contractors, who are encouraged to bring their customers in to see new designs and make selections. Many contractors send their customers in to see what is available.

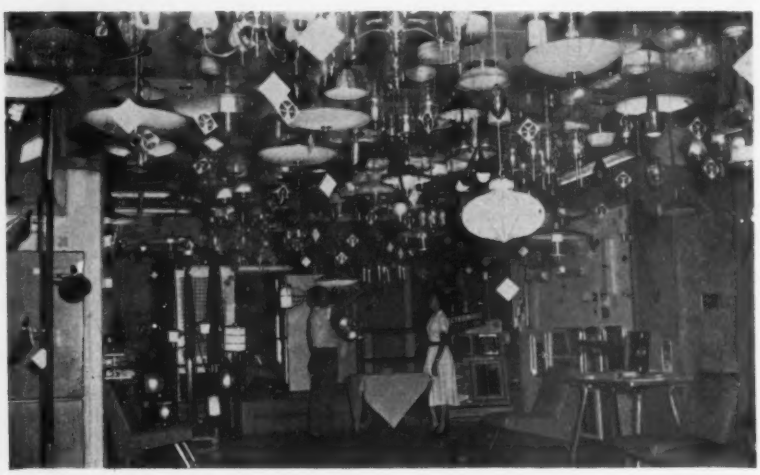
Kingsport Electric Company does not wait for them to come in and see, though. It goes after them through frequent ads, with illustrations, promoting the display room.

"These ads have helped sales quite a bit," says F. G. McCoy, who is in charge of the display room. "Electrical contractors and customers come in and look at the modern displays and make selections.

"Many, are people who are building new homes. Also, there is a trend toward built-in things. Builders are finding they have to put in built-ins in order to sell their homes.

"People planning a new home are more light-conscious, too. They're putting in better lighting and planning their lighting before they build. We are always glad to help anyone plan correct lighting or built-in electrical installations. More people now, too, are changing fixtures, modernizing them, and replacements are much better."

Besides the ads to bring people in, jumbo postcards showing the



Electrical contractors are invited to use the display room and participate in the sales. All salesmen are trained to assist contractors, architects, and engineers in specifications on equipment.

display room, in color, are sent out. A standard size postcard could have been used, but it would not have shown up the large displays so well. The larger size was found to be worth the extra expense.

The company gets reports on new homes and other construction, including lists of building permits at various cities in the area. "Whenever we find out someone is building a house, we mail that person a jumbo card," explained Mr. Carson. "This is a service for our electrical contractor customers, too.

"We invite the electrical contractor to use the showroom and to participate in these sales. It would not be good economics for every contractor to have a display room. One centrally located room works out better.

"Besides lighting fixtures, we show ranges, heaters, water heaters, fans, and refrigerators. We give demonstrations, particularly on built-in appliances, and have two persons on the floor all the time. Even bathroom scales are built-in now, and we demonstrate those, too," Carson said.

All salesmen are trained to be able to assist electrical contractors, architects, and engineers in specifi-

(Continued on page 110)

Outdoor lighting fixtures have become increasingly popular among people planning new homes.

Hampton, Virginia's heat pump packaged air conditioned school was made ready for elementary classes in September. Thirty-six GE Weathertron heat pumps will provide continuous automatic heating and cooling. Perry Electric was the installing contractor; Williams, Coile, Blanchard and Associates were the architects and engineers.

Heat pump air conditioned school

◆ THE FIRST heat pump packaged air conditioned school was made ready last fall for its elementary classes in Hampton, Virginia. Equipped with the very latest development in heating, which saves $6,000 in installation over conventional methods, the new modern styled school plant will have a bonus feature of air conditioning at no additional cost.

Thirty-six General Electric Weathertron heat pumps are being put into place and will give continuous automatic comfort throughout the year without even the flick of a switch. School children will be healthier—no open windows in the winter causing drafts and colds. Comfort in the classroom will be assured by maintaining temperatures and humidity at a level that permits ease of concentration for the young children.

According to W. Boyce Blanchard of Williams, Coile & Blanchard and Associates, architects and engineers for the John B. Cary school, the added feature of air conditioning without additional cost will allow facilities of the school to be used for educational purposes during the usual off-school months. He explained that the tight situation arising from the lack of sufficient school facilities in the area will be, in part, alleviated.

Among other new features characterizing the latest design of the John B. Cary elementary school are architectural concepts that have helped the Board of Education of Hampton save $35,000, Boyce added.

By employing the idea of "deep" classrooms, a number of advantages can be realized. For example, a shortening of the primary classroom wing from 209 feet to 140 feet and a shortening of the elementary classroom wing from 312 feet to 245 feet will make a total reduction of 136 feet. As a result, the original corridors will be shorter.

The deep classroom will permit a savings of 1,920 sq. ft. of floor area of which 865 sq ft. are corridors, which, due to their special finishes are considerably more expensive than instructional space.

Further advantages are realized with elimination of structural steel lintels placed over exterior windows. The classroom dimension being deepened allows a six-inch thick, cellular steel, roof-deck to span in a direction parallel with the corridors using interior partitions as bearing walls.

Constructing the roof-deck in this manner and, at the same time lowering the ceiling height to ten feet, by using sky lights, saves more than 87,784 cubic feet of space.

The Fourth National Electrical Exposition, a companion of the 57th anniversary NECA convention, attracted the exhibits of 164 manufacturers and distributors who occupied a total of 245 booths.

Contractors aim at larger

By Baron Creager

This article should be especially helpful to the following readers:

Electrical Contractors ✔
Electric Utilities ✔
Electrical Wholesalers ✔
Electrical Inspectors ✔
Industrial Engineers ✔
Consulting Engineers ✔

◆ MORE THAN HALF a dozen ways of advancing contractor efficiency toward getting a bigger slice of the estimated market of $14½ billions were explored and dramatized during the 57th anniversary convention of the National Electrical Contractors Association, held recently in Dallas.

These explorations were by means of panels, at least one of which produced intriguing testimony; playlets with sales scripts; jumbo slide presentations; and one sound movie. Further multiple assaults on the 14½-billion-dollar market were suggested in remarks by some of the principal speakers, and in individual contacts between contractors and factory sales personnel manning the Fourth National Electrical Exposition.

This event, a companion of the convention for the past four years, attracted the exhibits of 164 manufacturers and distributors who occupied a total of 245 booths of standard 10 by 10 size. A sustained interest in this product show was manifested by contractors throughout the three display periods for a total of 12 hours, which was about the amount of time also consumed in four convention business sessions.

Largest convention

Referred to repeatedly by President Oliver F. Burnett as the biggest national convention in NECA history, the Dallas meeting drew a total registration of 2,414, according to George Roscoe, NECA director of public relations. Facilities and arrangements were also declared outstanding since all massed gatherings except social were under one roof in the new Dallas Memorial Auditorium.

After an opening welcoming program featuring the Dallas chapter and civic figures, the convention heard Clint J. Harder, secretary-treasurer, report the greatest membership in NECA history with 4,115 in 121 chapters and a financial position "growing stronger every year."

Paul M. Geary, executive vice-president, reported with regret, failure of NECA's principal legislative effort in the national congress and that "we are still subcontractors in the eyes of the Federal government." He also found concern in the fact that "our per cent of the total work is growing smaller," but expressed the determination of NECA to find out through a marketing program the why of this trend. He added a belief that this investigation will show that a general improvement in selling, accounting, and management is needed and added:

"If everyone who wants to be a contractor would study business management first, many would never start."

President Burnett said he chose to speak extemporaneously, from the trend of his current thinking, and warned that a contractor cannot concentrate on production, "in which most of us excel, nor management, but must keep the basic factors in balance." These, he specified, are production, sales and finance. He continued:

"The way to do that is to have two basic, fundamental objectives: Number one is, obviously, to make a profit. We must make a profit. Number two—the business must exist for the purpose of giving other people opportunities to develop their careers.

"If you want to make a profit, you must do it through other people. The smart business man is one

Panel discussion, left to right: E. R. Cornish, NECA director of technical and training services; Shirley Sontag of NECA staff; Martin Bath, St. Louis, E. C. Peele, Burlington, N. C.; Al Goldfine, Freehold, N. J.

share of electrical market

who satisfies the needs of employees, then they will produce that profit for him. I see no reason why we shouldn't give a man a reasonable increase in pay, and I think we should keep that word 'reasonable' in mind in our negotiations."

He digressed to point out instances where IBEW had developed certain markets for contractors and to declare that NECA is getting only about 10 per cent of the $14½ billion market.

He concluded: "The future of this industry depends upon the ability of electrical contractors to sell electrical contracting."

Panel discussion

Perhaps the most provocative panel was that dealing with the public relations and marketing research program. It was preceded by a playlet intended to show the importance of this program.

This panel demonstrated how research is actually conducted by asking pointed questions of various types of customers. Individuals questioned, in various business fields from Dallas and Fort Worth, were a utility representative, industrial manufacturer, housewife, building manager, and general contractor. Questions were put by Bernard West, of West, Couey, and Leckie, New York, a firm doing part of the research.

In response to questions, Gerson Berman, chief of substation and transmission design, Texas Power and Light Co., Dallas, said that because of the technical nature of this work, his company is better satisfied with non-union labor. Asked why, he replied: "We can talk to the worker, or supervisor, if it is non-union labor. We can't even talk with a union foreman, but must go to the steward."

In response to other questions, George Bock, Bock Construction Co., general contractor, Dallas, said he thinks AGC is more matured than other organizations, including NECA, that efficiency of NECA is not the best yet, but better than a few years ago. He added that bidding by electrical contractors is too cheap "and I don't like it that way." Asked what he thought of the NECA bid depository system, he replied: "It shows a weakness. Who are you trying to keep honest?"

There followed a dramatization of the electric heating market, with jumbo slides, by the NEMA electric house heating equipment team, then the first announcement of details of Edison Electric Institute's promotion program for 1959, with slides, by C. A. Tatum, president of the Dallas Power and Light Co.

This consumed the second general convention session and the third was largely filled with education of a contractor, Mr. I. M. Confused. Through playlets, he got a new viewpoint on mechanical bookkeeping, estimating, and management. This session concluded with a dramatic safety presentation by C. C. Haggard, director of safety, California-Oregon Power Co.

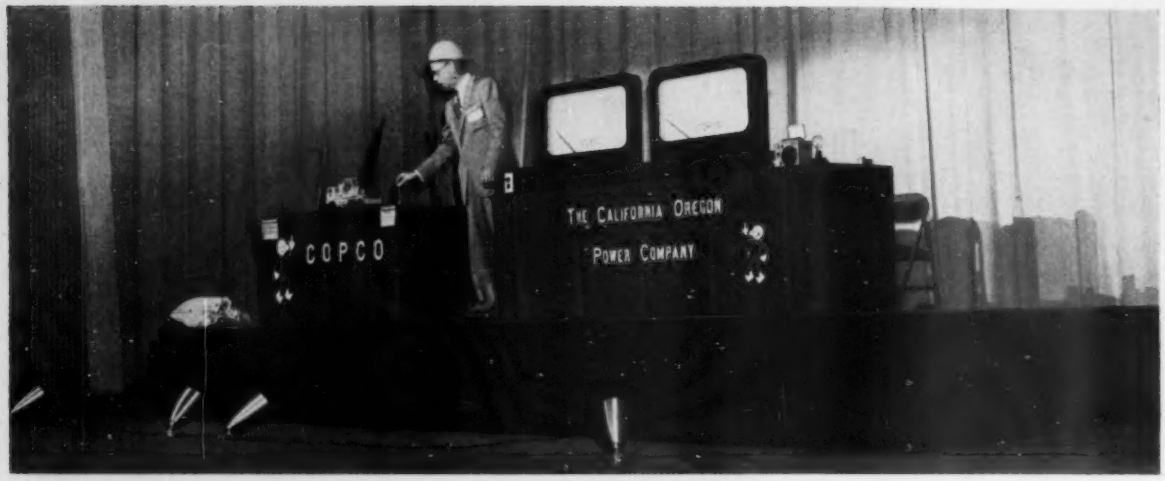
Utility line construction

While this session proceeded under the chairmanship of G. C. White of Fort Worth, vice-president, District 5, President Burnett and Vice-President Geary launched a utility line construction forum in another section of the auditorium. There followed an apprenticeship and training panel presentation with Bill Damon as moderator. He is director of the national joint committee on apprenticeship and training.

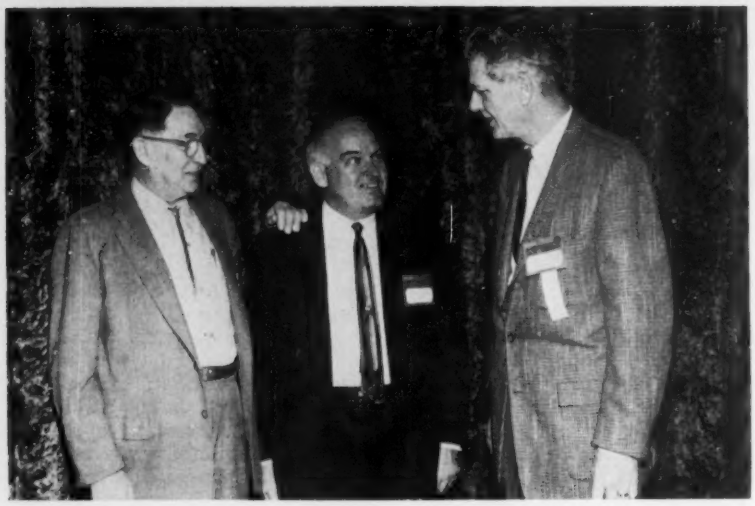
Three nationally-recognized figures spoke to the fourth and concluding general membership meeting on Saturday morning.

Jerome D. Fenton, general counsel, NLRB, was introduced by President Burnett after the latter referred to a "recent decision of the board that has created many problems in our industry."

Fenton showed himself to be a baseball fan by telling a baseball



C. C. Haggard, safety director of the California-Oregon Power Co., gives the contractors a safety demonstration.



Sideline huddle, left to right: Rob Roy, president, Northeast Texas Chapter; George Roscoe, NECA director, public relations; Lawrence Martin, manager Dallas Chapter.

story and then declaring that, "like Umpire Bill Clem, I have to call 'em like I see 'em."

He discussed in some detail—and in typical NLRB terms—the union hiring hall procedure and the Mountain Pacific case on which the board based its hiring hall decision. Then he referred to the substitute hiring hall procedure proposed by the board and said that in the substitute:

"The good of the hiring hall practice has been retained and the board has sought to discard the evils. Coercion of job seekers is as much the heart of the matter as is discrimination."

Later he said, "Hence I must conclude that standards for hiring must be fixed by mutual agreement and must not be subject to unilateral control by the union.

"In the last eight months, the efforts to adjust in the construction industry have been manifest. But it is not unlikely that the U. S. Supreme Court will be called upon to decide the issue.

"It has always been the policy of the office of the general counsel to assist both union and employer, and I hope my remarks today are in furtherance of that policy."

Technical training

Oscar C. Smith, director of industrial relations for the Atomic Energy Commission discussed "The Need for Technical Training." Quoting sources, he said the requirements for construction electricians would be 50 per cent more in the next ten years, over the estimated 125,000 employed at the beginning of 1955; and that 2,000 to 3,000 job opportunities will arise annually for new workers to be trained for electrical craft jobs in the utility industry.

He added that "the commission has assumed that, exclusive of the turbo generator, the likely cost of a nuclear reactor will be about 2½ times the cost of a conventional (generating) plant. This suggests that more manpower will be required in building nuclear plants than in conventional plants."

Gordon M. Freeman, international president of IBEW, introduced the union film, "Operation Brotherhood," before he made the concluding address.

"The electrical worker and the contractor have come a long way," he said, "and have attained a degree of prosperity. But we must recognize it carries with it certain dangers.

"Within the past six months we have tried to develop a hiring hall plan that will work and meet the requirements of the NLRB. Some contractors have treated our plan as a bargaining demand, which was

(Continued on page 110)

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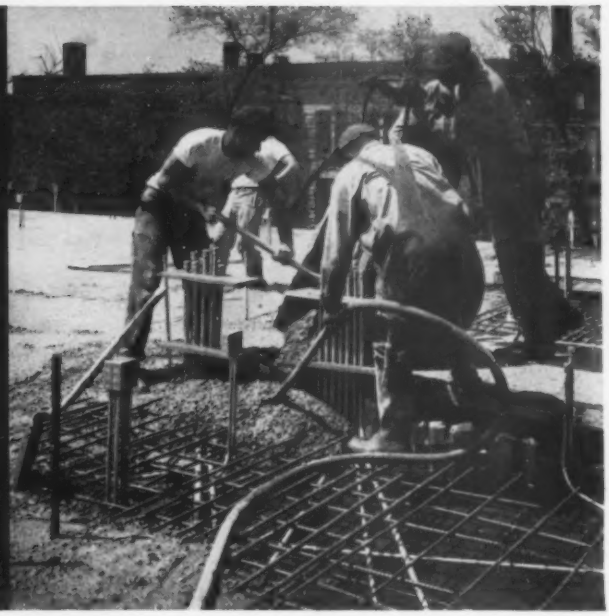

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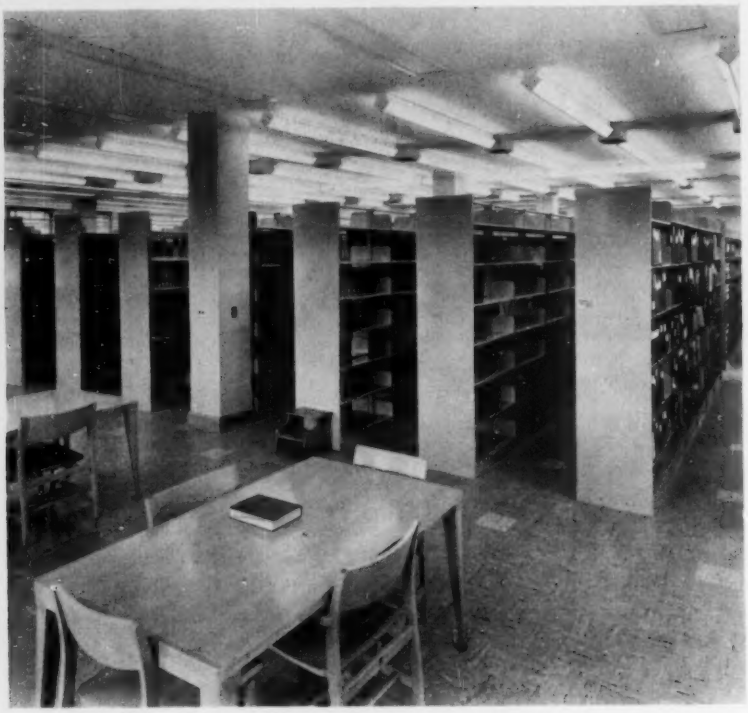
Library illumination brightens book-browsing at Southern colleges



◆ GENEROUS AISLES of high intensity light saturate library bookshelves at Howard College, of Birmingham, Ala., at left, with an average of 35 footcandles maintained, affording low brightness plus soft-shielding beauty.

Light is well distributed to the general aisle area of the college library and is intensely directed to the stacks so that book titles can be read easily and quickly.

Birmingham Electrical Engineer Joe Nall, of Hazzard, McRoy & Cone, specified Guth V-C-U fixtures with Gratelight louvered diffusers, which integrate beautifully with the over-all decor.

The diffusers provide exceptional lamp hiding power and additional light diffusion. The ⅜-inch open cubicles assure noise reduction qualities and easy maintenance.

Libraries at Howard College, of Birmingham, Ala., at left, and Marymount College, of Salina, Kansas, below, are lighted by Guth fixtures.

◆ OVER-ALL electric ceilings radiate soft, resplendent, high intensity lighting in this remodeled library of Marymount College, Salina, Kansas, shown at right.

Fifty maintained footcandles of low brightness illumination is provided by over 3,000 square feet of Gratelight louver diffuser in a beautifully silent and functional manner.

Electrical contractors had a major construction obstacle to overcome. Jarrett Electric Company mounted the Gratelight panels under crossing beams 15½ inches deep X 15 inches wide, which allowed only a nine-inch plenum under the beams, with a 24½ inch plenum between beams.

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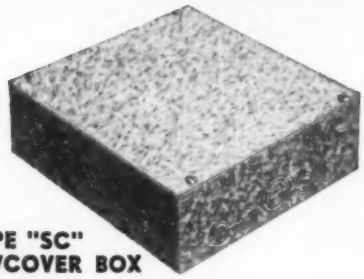

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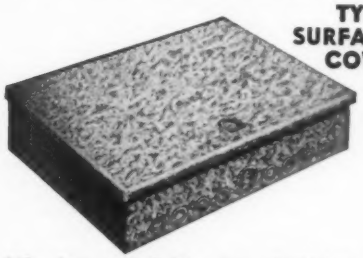

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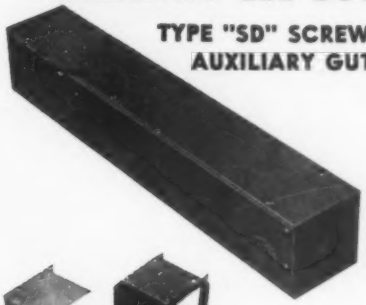

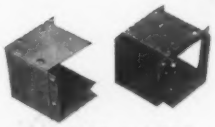

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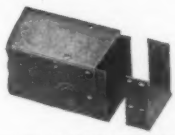

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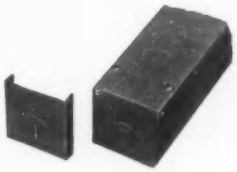

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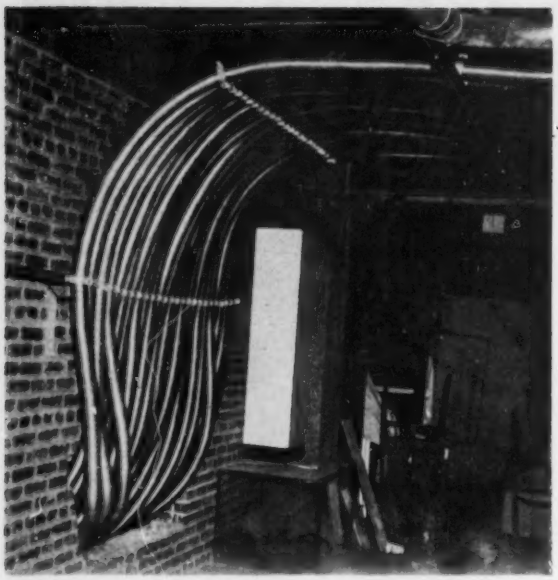


In the Shoreham Hotel installation cable was pulled onto large pipe rollers fastened to the racks.

Workmen strip heavy insulation from conductors to prepare cable for connection to the switchboard.

Interlocked armored cable aids installations in close quarters

By A. A. Rickman

Vice-President, Engineer
E. C. Ernst, Inc.
Washington, D. C.

This article should be especially helpful to the following readers:

- Electrical Contractors ✔
- Electric Utilities ✔
- Electrical Wholesalers ✔
- Electrical Inspectors ✔
- Industrial Engineers ✔
- Consulting Engineers ✔

◆ EVERY CONTRACTOR is familiar with the tight physical conditions he is sometimes up against on rewiring existing buildings where circuit capacity is being increased. We at E. C. Ernst, Inc., Washington, D. C., ran into this difficulty at the Shoreham Hotel in Washington where we were relocating the service (2-4000 amp. 120/208 volt) for the entire west half of the building. The problem of getting feeders through the structure and working in very close quarters without interrupting the hotel's operation had us stopped momentarily. Some new approach had to be found.

Space and cost problem

The only available space in the building structure was an opening three feet wide flanked by two columns. We first considered using bus duct for the job, but we found that approach to be physically impossible in this case as well as costly. Using conduit and wire would have held our price down, but this was also physically impossible.

Our solution was to use interlocked armored cable which gave us the ability to maneuver cable in any way we wished. Only this type cable was possible working within the small 3-ft. space.

One other situation also caused trouble. We had to run cable through an operating laundry where there were high temperatures and moisture. Here conductors had to be protected from corrosion and deterioration. Aluminum interlocked cable solved this problem most satisfactorily.

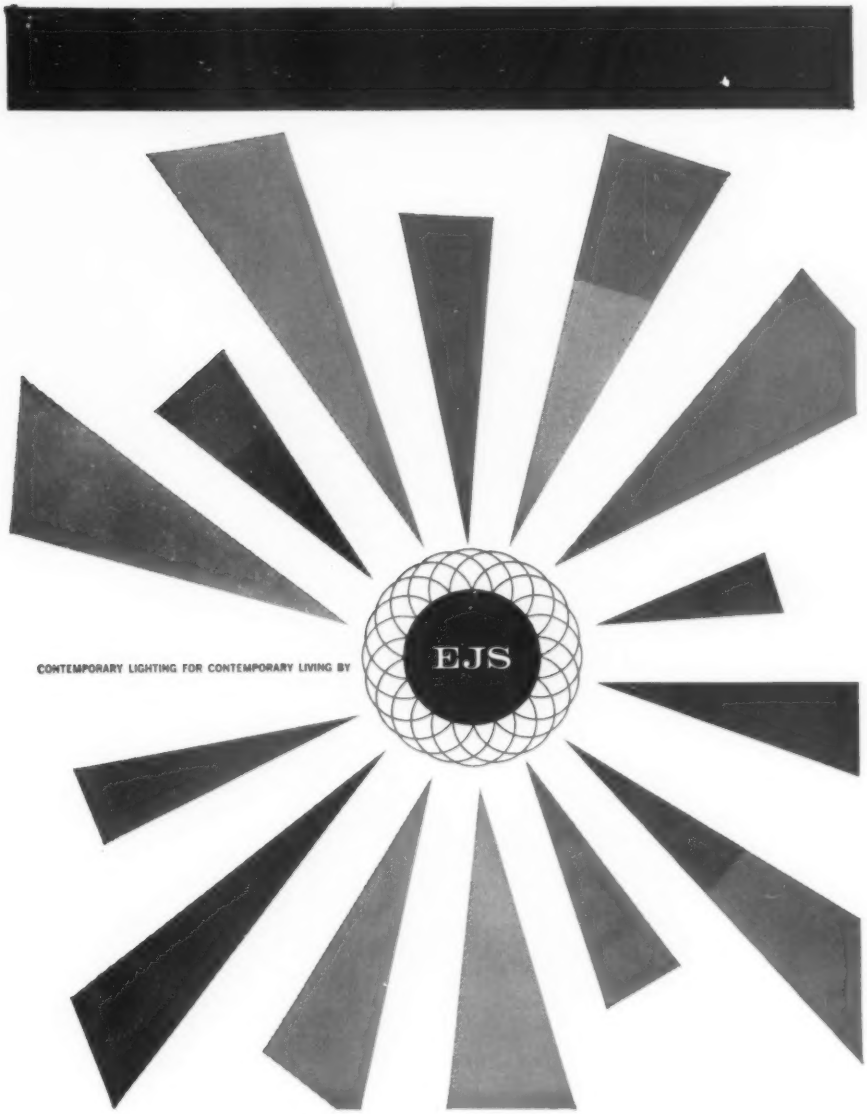
We used varnished cambric insulated cable to take care of the current carrying capacity, and plastic insulation covering cables protected conductors from moisture. The cable was mounted on racks rather than on cable trays for purposes of economy as well as for greater ease of installation with the irregular runs that were necessary. Cable was pulled onto the racks over large pipe rollers temporarily fastened to the racks. We found that these rollers had to be very large to prevent damage to the cable and avoid additional labor costs due to resistance offered.

Softness of aluminum

One problem in installing aluminum interlocked cable is the softness of the metal. Care had to be taken so that it did not ride on sharp corners.

We were able to make the en-

(Continued on page 109)



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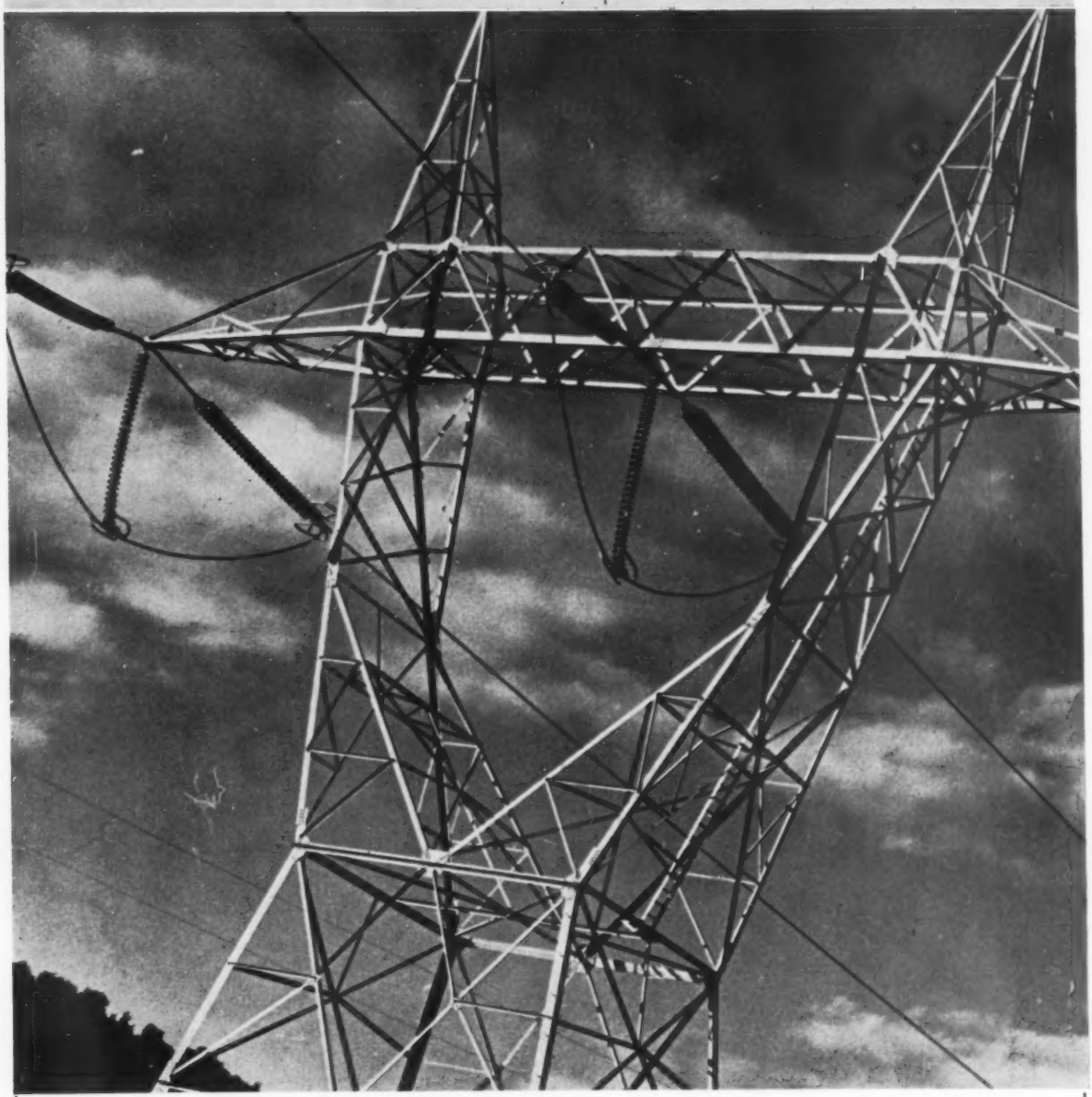

Controlled primary street lighting system—page 42
Balancing phases on primary feeders—page 46

Controlled primary street lighting

By Hugh Smith
Engineering Department,
Electric Power Board
Chattanooga, Tenn.

◆ THE MOST COMMONLY used scheme for street lighting in the past was a series circuit run from a substation where the transformer was located and where the circuit could be energized by closing a manually-operated switch. With the extension of street lighting to outlying areas and the increasing of primary voltages, this scheme has decided disadvantages.

The commonly used distribution voltage in the order of 7200/12,470 volts means two levels for the two-voltage classes if a series circuit is to be employed. Since these outlying areas are in general fed from small unit-type substations, then some type of remote control is required for street lighting circuits. Multiple - type lighting circuits have become predominent in these areas and are the answer to the higher distribution voltages. They operate at 120 or 240 volts, the standard secondary voltage, and are installed along with the secondary circuits, thereby eliminating the necessity of two primary-voltage levels.

In most cases this means that existing poles will suffice whereas installation of a series circuit could mean replacement of a large number of poles for additional height. Voltage drop for multiple circuits limits the number of lights to a circuit and necessitates a more complex control scheme. Probably the most used multiple circuit is the one in which the lights are fed from a distribution transformer and controlled by a photo-electric relay switch. Additional multiple circuits may be added by cascading off the end of existing multiple street lighting circuits. An arrangement like this will give several street lighting circuits operated at 120 volts, fed from distribution transformers controlled by a photo - electric relay switch and cascade relays.

This type circuit is fairly reliable, operates at low voltage (120) and if properly applied provides good illumination, but it requires photo-electric relay switches, and cascade relays. These devices are scattered at various locations, which from an operating viewpoint has certain disadvantages such as testing, trouble shooting, and maintenance.

A controlled primary street lighting system incorporates the simplified central circuit control of the series circuit and requires only one level of insulation in the 7200/12,470-volt areas thereby eliminating the need for extra-height poles. This results in a multiple-type circuit operating at 120 or 240 volts and fed from small conventional distribution transformers installed exclusively for street lighting. A primary street lighting wire is installed on the crossarm with regular primary distribution phase wires, and operated at the same primary voltage. Only one primary wire is required for street lighting since the system is Y-connected with grounded neutral. Supply to the street light primary passes through an oil switch (controller), which is opened and closed by a controlling device. The most commonly used controlling device is the photo-electric relay switch.

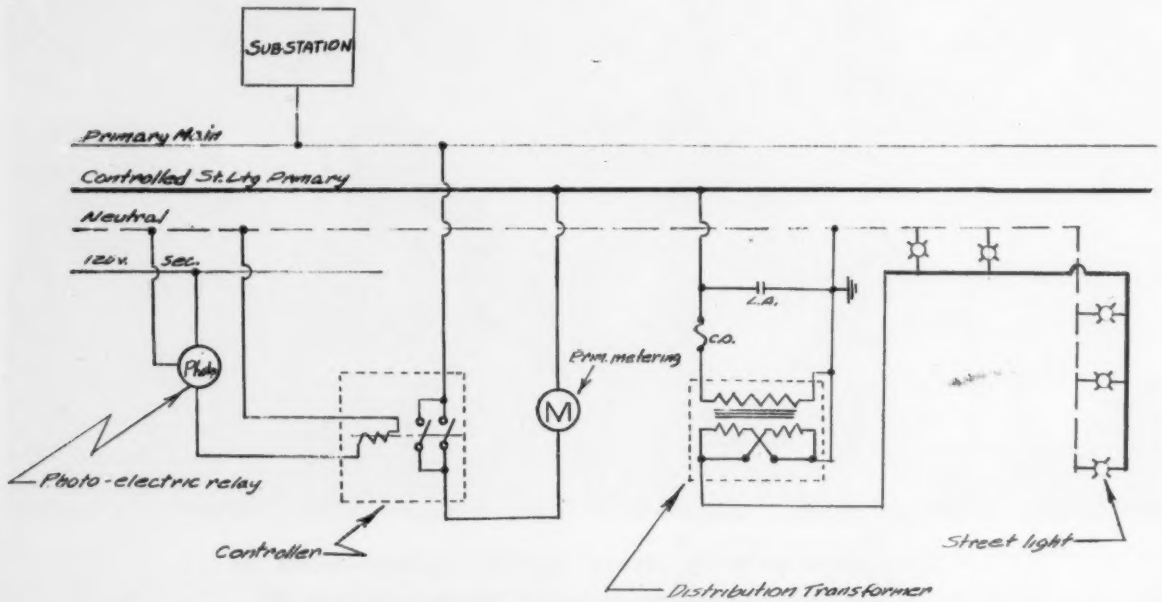

Fig. 1—Schematic wiring diagram of circuits for primary controlled street lighting system.

A typical arrangement for this system is shown in Figure 1. This scheme permits street light coverage of a large area with one set of controls which are installed near a centrally located substation, minimizing voltage drop, and improving conditions for testing and maintenance. Also, the energy usage may be easily determined by one point metering. Transformers are connected with the two secondary coils in parallel with one side grounded for 120-volt lights, or where 240-volt lights are used, such as mercury lights for white ways on main thoroughfares, the secondary coils are connected in series with one leg grounded.

All street lights are connected in parallel between the neutral and street light secondary wire, fed from a small conventional transformer energized by the street light primary which is controlled by an oil switch. When properly designed, this provides a very reliable system of street lights with a great deal of flexibility since lights may be added to or taken away from the system with a minimum amount of work.

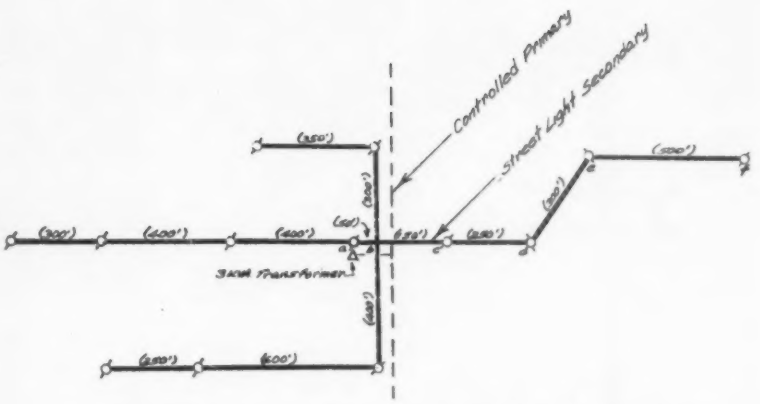

Fig. 2—One line diagram of multiple street lighting secondary.

One of the main considerations in the design of a controlled primary multiple street lighting scheme is the loading of transformers. The transformers should be loaded at near rated load since the demand factor would be 100 per cent. However, it should be noted that the load factor will be around 50 per cent in winter months and somewhat less in summer months. This indicates that transformers can safely carry more than rated load, and so with transformers in-

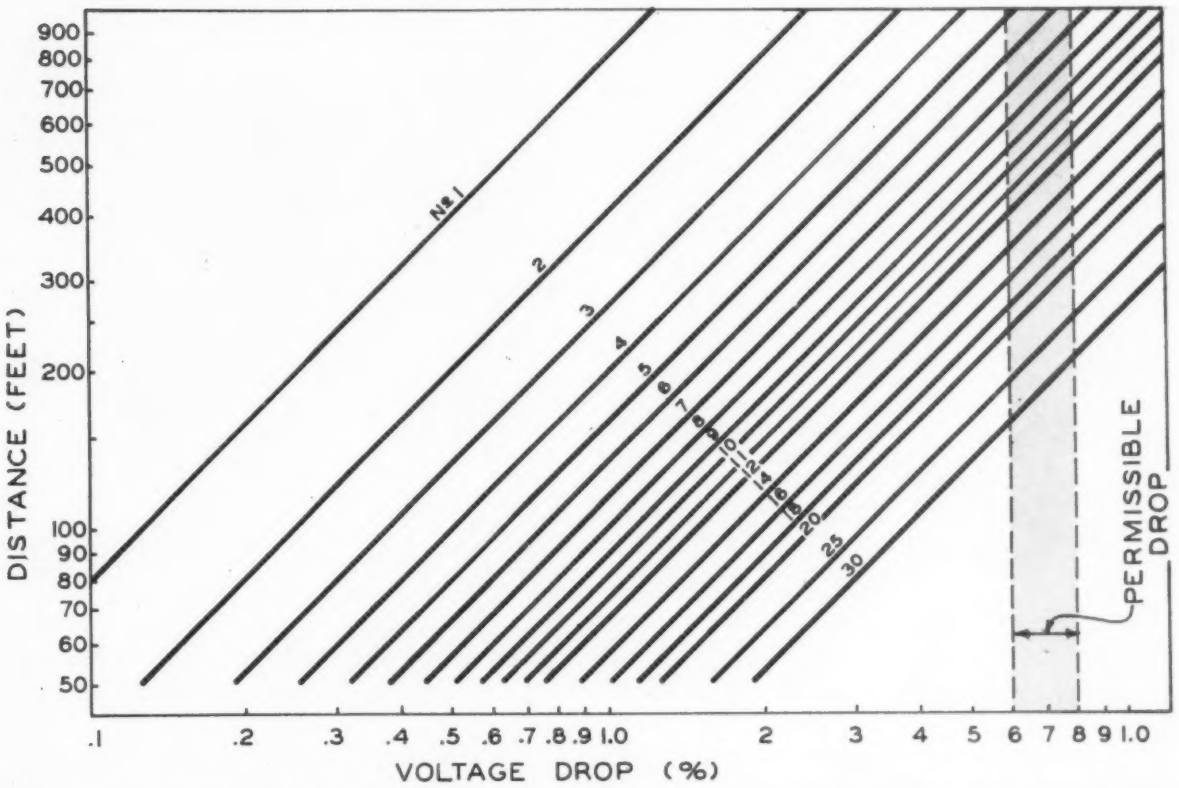

Fig. 3—Chart for determining voltage drop on multiple street lighting system. N is number of 2500 lumen lamps; N/2.2 = number of 6,000 lumen lamps. The chart is based on 120 volts and #4 Al. secondary. For #2 Al. secondary take 70% of chart results; for #1/0 Al. secondary take 50% of chart results.

Fig. 4—In the center on a double arm is the controller with a current transformer and potential transformer to the left. Photo switch is on road side of pole.

Fig. 5—Details of six-foot bracket arm 2,500 lumen street light fed from pole on rear property lines of lots. Neutral is in top position; 120 volt line below.

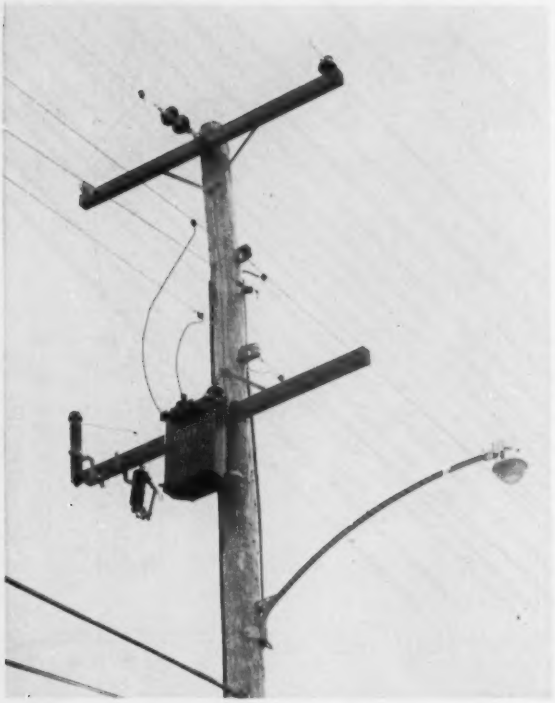

Fig. 6—This is a typical 7200/120 volt transformer installation used exclusively for street lights. It is plainly marked "SL" so it can be readily identified.

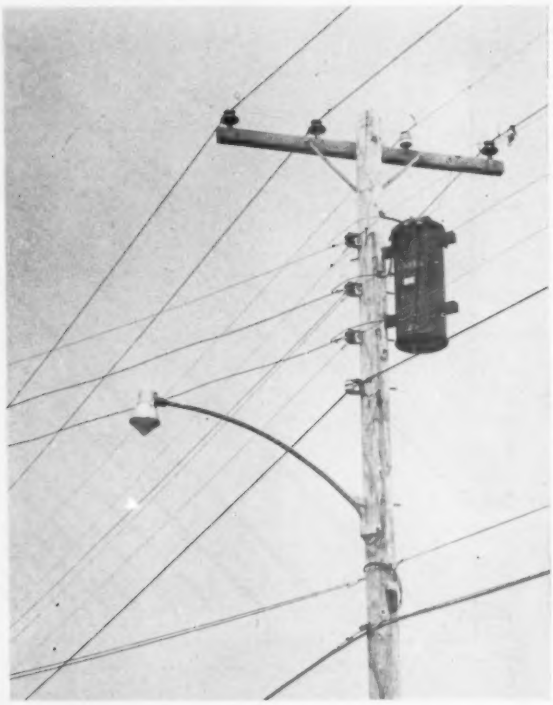

Fig. 7—Typical pole with distribution transformer. Regular 120/240 secondaries are on brown spools; the street lighting 120-volt secondary is on white spool.

itially loaded at near 100 per cent load, additional lights can be added without replacing existing transformers with larger size transformers.

The location of the transformer will to a great extent govern the number of lights on the secondary circuit. Voltage drop limits the number of lights per feeder, since to connect an excessive number of lights on a feeder would require a large uneconomical size of conductor to keep the voltage drop within limits. Transformers located near intersections can feed radially along four main feeders to lights and small taps thereby giving a maximum number of lights per transformer without using excessive size secondary conductors.

Probably the main consideration in the controlled primary scheme is voltage drop. Only the secondary voltage drop need be considered since any drop on the primary is negligible by comparison since a standard size conductor (probably #4 al or #6 cu) is used for primary with usually a light connected load.

Radial feeder system

By locating the controls near a centrally located substation, the primary will feed radially from the oil switch in several directions with a net result of several street light primary feeders, each lightly loaded and having a negligible voltage drop. Since all lights are designed for some particular voltage, and limited to a certain range of voltage for satisfactory operation, the design of the street light secondary should supply a voltage at a certain defined value. This value should be limited to 6 per cent to 8 per cent in regulation.

In consideration here, a 6 per cent voltage drop will be assumed a maximum for good lighting. The secondary feeds from the transformer and picks up load all the way, therefore the light farthest out will have the lowest voltage or greatest voltage drop, which should not exceed 6 per cent.

For further clarification refer to the example given in Figure 2, which shows a one line diagram of a multiple street lighting circuit that is operated from controlled primary. A 3-kva transformer is shown at "a" and by studying the diagram for a minute it becomes apparent that the greatest voltage drop will be to lamp at "f" provided of course all lamps and secondary conductors are of the same size.

It is also apparent that if the voltage drop "**V**af" falls within the allowable limits, then no other drops need be calculated. Voltage drop "**V**af" may be calculated quickly from the graph in Figure 3, which gives the voltage drop for any number of lights at any distance. The chart was designed for 2500 lumen lights using #4 al secondary; however, drops for other size lamps or conductors can be calculated by using the constants given. Voltage drop "**V**af" is the sum of voltage drops **V**ab + **V**bc + **V**cd + **V**de + **V**ef.

By use of the graph, voltage drop **V**ab can be read when **n** is determined and the distance "a" to "b" is measured. For this section of secondary **n** is equal to 9, which is the number of lights fed on this section. The per cent voltage drop, where **n** = 9 and the distance is 50 feet is taken from the graph as 0.56 per cent. For **V**bc, **n** = 4, and the distance 150 feet, a voltage drop of 0.76 is read from the graph. **V**cd, **V**de, and **V**ef are calculated in a like manner and then the total drop would be as follows:

$$\begin{aligned} \mathbf{V}af &= \mathbf{V}ab + \mathbf{V}bc + \mathbf{V}cd + \mathbf{V}de + \mathbf{V}ef \\ &= .56 + .76 + .95 + .75 + .64 \\ &= 3.66 \text{ per cent} \end{aligned}$$

This value of **V**af is below the allowable voltage drop of 6 per cent, and all lights fed from the 3-kva transformer will operate satisfactorily. Where it is not economically feasible to lower the voltage drop to 6 per cent, an 8 per cent drop may be allowed. It is also possible to add several lights to this circuit without necessitating any changes. Had the drop been slightly over the allowable voltage drop, then a larger size conductor from "a" to "b" probably would lower the voltage drop below 6 per cent.

In summarizing, it should be remembered that street lights are grouped in separate circuits with the transformer located to give adequate voltage to all lights and at the same time leave capacity for future additional lights. Controlled primary street lighting certainly has many factors in favor of its use. Reliability, good operation, and easy maintenance are but a few. For many utility companies it is a good way to put into use some of those surplus small transformers.

Load distribution analog computer

◆ A LOAD DISTRIBUTION analog computer which provides instant, visual interpretation of operating data in public utility electric power systems, and said to range in cost up to 50% less than conventional apparatus performing the same function, has been developed by the Belock Instrument Corporation, College Point, New York.

Housed in a compact and portable cabinet, convenient for desk top use, the new computer replaces current room-filling devices. Operated by the manipulation of dials, it also does away with the need for "load slide rules" and consultation of charts, graphs and curves.

Designated as BELAC, the economy loading analog computer is adaptable for custom programming to meet special electric utility system requirements and helps reduce fuel and maintenance costs by furnishing information on what is the most efficient load distribution among many generators at any given moment. Providing direct and immediate reaction to changing load situations, it reduces response time and allows adjustment to variable conditions in the dispatch of information not covered by fixed charts. It does not depend upon pre-calculated data.

Information fed to the computer by manual adjustment of control knobs includes fuel cost, maximum and minimum capabilities of individual generators in a system, base load generation, interchange sales and system total.

Provision is also included for future insertion of the effect of line losses on economy loading computations and the value of

(Continued on page 106)

Methods of balancing phases

By R. A. Nicholson
Supt. Electrical Engineering
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San Antonio, Texas

◆ IN ORDER for an electric utility to operate at peak efficiency, the load should be evenly divided, or balanced, between the phases over the entire system. Obtaining and keeping this universal balance is dependent on having the load on each primary circuit distributed equally over each of its phases. Therefore, this is the level at which utilities attempt to maintain their load balance.

Many different methods are used to accomplish this result. For instance, one utility follows a plan by which load balance is controlled through a detailed system of records. A separate page in a loose leaf binder is prepared annually for each distribution circuit on the system. See Figure 1 for a sample copy of one of these pages.

During the yearly peak load period, recording meters are put into operation at the substations to obtain the load data for each phase of each primary circuit throughout the system. This test data is entered at the top of the proper page for each circuit. On this same page each phase is provided with two vertical columns, one of which is labeled "Transformer Kva Issued" and the other one is labeled "Transformer Kva Installed."

All transformer orders issued during the year are routed through the Records Section. As each order is received, the kva of transformer capacity involved is entered in the "Kva Issued" columns of the respective phase and circuit on which the transformer is to be installed, or from which it is to be removed. Installation orders are considered as "plus" transactions, and removal orders are considered as "minus" transactions.

With each entry the cumulative total of the kva of transformer capacity issued is computed and recorded. When a transformer order has been completed, it is routed back through the Records Section and the capacity involved is then transferred from the "issued" column to the "installed" column. Thus it becomes possible at any time during the year to refer to the page pertaining to any particular circuit and ascertain the various phase loads at the time of the system peak, the total amount of transformer capacity that has been installed subsequently on each phase, and the amount that has been issued, but is yet to be installed on each phase.

As the totals accumulate through the year, they are checked to see that the distribution over the phases is such as to keep the circuit in balance. If it becomes evident that one phase is getting more or less than its share of capacity, the engineers or planners who specify the phases on which the transformers are to be connected are advised of this fact so that they can adjust their phase specifications accordingly.

The above system keeps the total circuit load in balance, but does not serve to keep individual sections or branches, in balance. It is, therefore, necessary occasionally to make a study of the map records and, possibly to supplement these studies with actual field tests on branch circuits, in order to make the correction needed to keep the individual segments of the circuit in balance.

Neutral current method

Another utility is inaugurating a plan based on the fact that unbalanced current in a circuit is always carried by the neutral conductor. It is proposed to install an ammeter jack in the neutral conductor of each circuit at the substation from which the circuit originates. A portable plug-in type ammeter can then be used to check the unbalance on any circuit at any time, or a complete substation or system survey can be made quickly and with a minimum effort.

When the amount of neutral current indicates that a circuit is becoming seriously unbalanced, the map records will be studied and certain transformers will be selected for transfer from one phase to another in order to restore the desired circuit balance.

Indicating ammeter method

Another method being used is to note the readings on the indicating ammeters in each phase of the distribution circuits at the substation from which they originate. When necessary, these readings are supplemented with additional readings taken out on the line at strategic locations with a split-core type indicating ammeter mounted on the end of a "hot stick." From the information thus obtained the necessary shift in transformer capacity between the phases is made to bring the circuit back to a satisfactory condition of balance.

One system of determining the distribution of transformer capacity between the various phases also takes into consideration the unbalance existing in voltage between the different phases. Recording voltmeter tests are made both at the station and at the load center for each phase of a circuit. Based on the results of these tests, transformer capacity is adjusted so as to obtain the desired voltage balance.

Probably the latest and most modern method of keeping the circuits in balance is one that uses IBM equipment with its assorted electronic calculators. This system starts with the kwh meter readings for each customer. These readings are "punched" into an IBM card which is "keyed" to the particular transformer from which this meter is served. The transformers are "keyed" to the phase and branch, or section, of the primary circuit from which they are served. A branch or section is set up so that it includes about twenty transformers. These sections and branches in turn are totalized to complete circuit data.

Once a year, at the time of the system's peak load, or as often as desired, the IBM equipment is set

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This article has been adapted from a paper presented before the recent Power Distribution Conference, sponsored by the University of Texas.

on primary feeder circuits

up to take the data from the individual kwh meter readings, and from this data turn out a complete report. This report shows the complete load data for each distribution transformer, for each section of line to which certain groups of transformers are connected, and also for the entire circuit.

The data thus obtained is then used as a guide by the engineers or planners who issue the transformer installation orders to specify the phases on which the transformers are to be connected. This system has other advantages, such as obtaining the load on individual distribution transformers, which are outside the scope of this discussion.

The common factor in all the plans for maintaining load balance is the actual installation and connecting of distribution transformers to the proper phase as specified by the planner. This means that the man in the field should be able to identify the various phases at the job site with a minimum expenditure of time and effort.

There are a variety of methods and aids which have been devised for identifying the different phase conductors in the field. When the wires are of the bare or weatherproof type a definite physical position may be assigned for each phase wire. For instance, when one is standing under the line and facing either North or East, the conductors will be in the order of A-B-C from left to right. This system can become confusing when the line approaches a Northwest — Southeast direction. Another method is to have the phases so arranged that when one is standing under the line facing away from the station at which the line originates, the phases will be in a definite position, such as A-B-C from left to right. This method requires that the field crew know the route of the line back to the substation.

When the line is on a street or road, the various phase positions may be specified, as "A" phase on the street side of the cross-arm and "C" phase on the property side of the cross-arm. This method fails

(Continued on page 106)

CIRCUIT	F-534
STATION	"O"

DATE TESTED	A Ø		B Ø		C Ø	
	PLANNED	ISSUED	PLANNED	ISSUED	PLANNED	ISSUED
9-5-58	115	1410KVA	105	1440KVA	320	1280KVA
	100	1425	80	1465	270	1330
	75	1450	130		255	1345
	125				230	1370
	135					

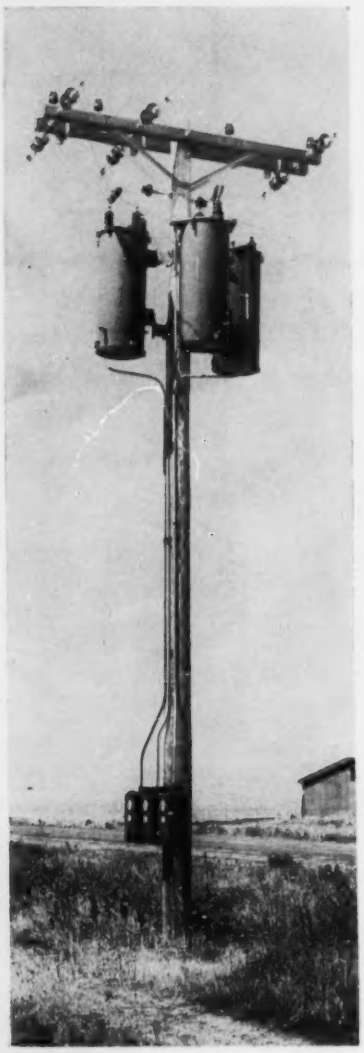
Fig. 1—Sample looseleaf form used by engineering department to record load balance on three phases of a primary feeder.

Fig. 2—Access to switch poles for phasing out underground cables is obtained by providing pipe plugs in the switch cover directly over the switch poles. Manufacturers are providing this feature.

Voltage regulator kva

By R. F. Gilton
Regulator Department
Allis-Chalmers Mfg. Co.
Milwaukee, Wis.

This is the second in a series of six articles on the subject of regulator application. Other articles will deal with special applications, ratings and proper location, loading and overloading, paralleling problems, and regulation compensation methods.



◆ KVA RATINGS are widely used throughout the industry to describe the performance capabilities of feeder voltage regulators. For most applications this is an accurate designation, and it can be used in the selection of regulators for specific locations on the power system.

In a few instances, however, there is no obvious relationship between regulator nameplate kva and circuit kva. In these cases, the current, voltage and per cent regulation of the regulator should be used to select suitable sizes of equipment.

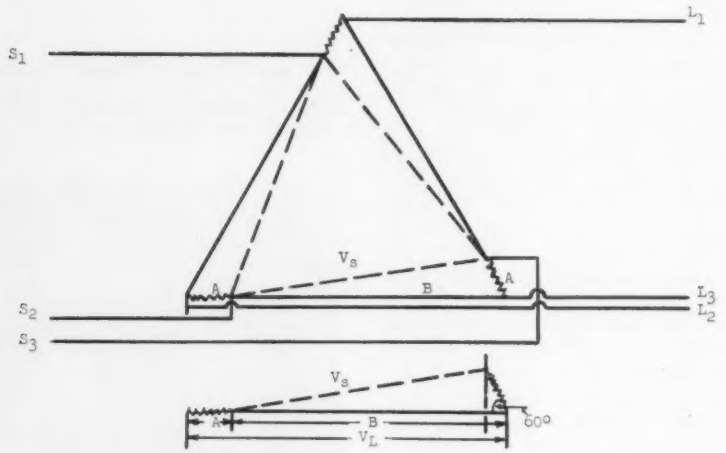
The calculation of regulator kva ratings is a relatively simple matter. For a single phase unit, the kva is equal to the current multiplied by the voltage and by the per cent regulation divided by 1000. The equation may be written:

$$\text{Kva} = \frac{\text{EI \% Regulation}}{1000} \qquad (1)$$

where E = voltage; I = current.

As an example, the number used for per cent regulation in this equation would be .05 for a ± 5 per cent unit. Since most regulators are ± 10 per cent units, it can be seen from Equation (1) that the single-phase regulator kva would be one tenth of the circuit kva. If a three-phase wye connected regulator is being considered, the regulator kva will be three times that of Equation (1) provided that phase voltage is used.

Introduction of the factor $\sqrt{3}$ in the denominator of Equation (1) will allow the use of line voltage in the equation.



V_s = Source Voltage
B = Exciting Voltage
A = Series Voltage = 10% of B
V_L = Load Voltage = A + B

$$V_s^2 = (B - A \cos 60°)^2 + (A \sin 60°)^2 = (10\,A - .5\,A)^2 + (.866\,A)^2$$

$$V_s^2 = (9.5A)^2 + (.866\,A)^2 = 90.25\,A^2 + .7499\,A^2 = 90.9999\,A^2$$

$$V_s = 9.535\,A \quad \text{and} \quad A = V_s / 9.535$$

$$V_L = A + B = A + 10\,A = 11\,A = 11\,V_s / 9.535 = 1.153\,V_s$$

Therefore, V_L is 15.3% higher than V_s and the regulation is approximately ±15% if ±10% regulators are used.

Fig. 1 — Analysis of three delta connected regulators showing that ± 15% regulation is obtained when ± 10% regulators are installed.

ratings explained

For a three-phase, wye connected regulator the equation can be written as follows:

$$\text{3 phase kva} = \frac{3\ EI}{1000\ \sqrt{3}} \times \%\ \text{Reg.} \qquad (2)$$

or dividing by $\sqrt{3}$:

$$\text{3 phase kva} = \frac{\sqrt{3}\ EI}{1000} \times \%\ \text{Reg.} \qquad (3)$$

where E = line to line voltage: I = line current.

If single-phase regulators are to be wye connected, each will supply one-third of the kva of equation three.

Equation (3) is the same as the equation for a three-phase transformer except for the per cent regulation term, and again in the case of a ±10 per cent regulator (the standard) the regulator kva is one-tenth of the circuit kva. This would indicate that it is only necessary to divide the circuit kva by ten in order to determine the required regulator kva. This is true for single-phase and wye applications, but it can lead to trouble when delta or open delta circuits are involved or when other than standard ±10 per cent regulation is required.

Assume that a 5000/8660Y volt, 5000 kva substation requires regulation. This is a straight forward application which would use a standard regulator if ±10 per cent regulation were required. The total regulator kva would be 500 and single-phase or three-phase regulators could be used. If single-phase units are selected, they would be rated 167 kva, 5000 volts and 334 amperes. A rapid calculation of the full load current involved in this substation will show that it also is 334 amp, and the regulators are properly applied.

Now take for example a 5000 volt, 5000 kva delta system. If the same line of reasoning is applied here, three single-phase regulators rated 167 kva, 5000 volts and 334 amp would be chosen. The kva and the voltage appear to be correct for this system. This is not true.

Single-phase distribution regulators

Single phase, wye, or open delta circuits

	Per cent regulation				
	± 10	± 8¾	± 7½	± 6¼	± 5
Per cent current*	100	110	120	135	160

Closed delta circuits

	Per cent regulation				
	± 15	± 13⅛	± 11¼	± 9⅜	± 7½
Per cent current*	100	110	120	135	160

*Refer to specifications for maximum current values

Fig. 2—This tabulation shows the allowable increase in regulator rated current if the range of regulation is reduced.

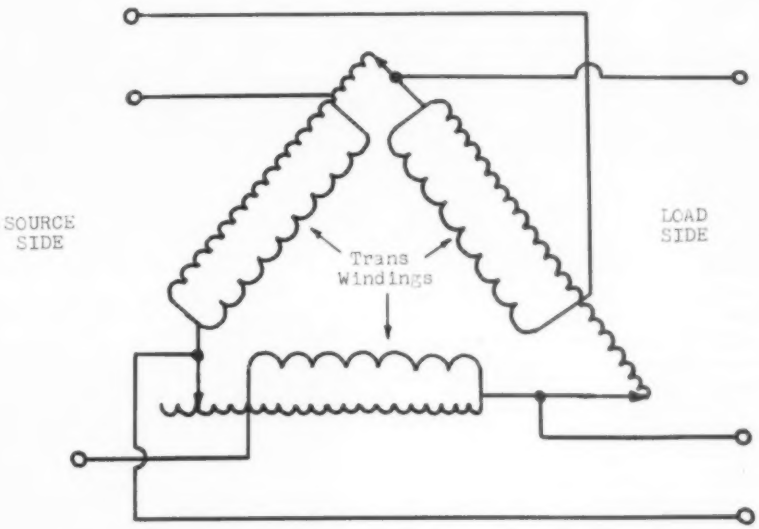


Fig. 3—Three single-phase regulators connected inside the delta. Single phase transformers are required for this type connection.

It is true that the phase current of a delta system is less than the line current. If this were a transformer application, the phase current rating, and therefore the transformer rating, would be 334 amp. However, since the series winding of a regulator is in series with the line, it must be able to handle full line current. The proper size regulator must have a current rating of 578 amp and 5000 volts.

By applying Equation (1), it is determined that each regulator must be rated approximately 290 kva. A three-phase unit would be

rated 3 times 290 or 870 kva. The current is the important consideration in this case.

This thinking can now be applied to an open delta regulator connection. Again, current is of prime importance in choosing the proper regulator. The required current is still 578 amp, and this is the same size unit as was required in the preceding paragraph. In this case, only two units are required to regulate the system.

There appears to be no advantage to operating in closed delta, and for most systems this is correct. However, there is one advantage to using the closed delta connection. As Figure 1 shows, three regulators connected in closed delta will give approximately ±15 per cent regulation when ±10 per cent units are installed. If the system requires such a range of regulation, it may be worth the additional cost of the third regulator.

There is one additional advantage in using the closed delta connection. As the example shows, the 5000 kva, 5 kv delta system required that the regulator be capable of handling 578 amp. It is possible to use the Vari-Amp feature which allows increased current capability with decreased regulation and three smaller delta connected regulators. The result would be that the actual regulation obtained would be approximately 1.5 times the Vari-Amp setting. As Figure 2 shows, the current capability of a distribution regulator can be increased by a fixed percentage if regulation is reduced. The chart shows the per cent regulation which is available for single phase, wye or delta connections at various current levels.

If the Vari-Amp feature is used in regulator application, the regulator kva rating becomes even less significant. There is now no direct correlation between substation kva rating and regulator kva rating and the current and voltage are the only criteria for regulator selection.

One other method of regulator connection is available for delta systems. This is called an inside the delta connection. In this case, the regulators' exciting windings are connected across the transformer secondary windings. The connections are made as shown in Figure 3. Single-phase transformers or three-phase transformers with all leads brought out to bushings must be used. Since the entire regulator winding is inside the delta, it is possible to use units which have a current rating equal to the delta phase current.

The regulation available when this connection is used will be the same as the rated regulation of the machine. In other words, the added regulation possible with outside the delta connected regulators will not be realized when the inside the delta connection is used.

It may be seen that regulator kva ratings are not always the best indication of regulator performance. They are of value in selecting regulators for single phase or wye applications on standard circuits requiring ±10 per cent regulation. If regulators are to be applied to open delta or delta systems, or the Vari-Amp feature is to be used, the required current and voltage of the system should be considered in regulator selection.

If the regulator series winding can handle the current, and the voltage is correct, the regulator is properly applied.

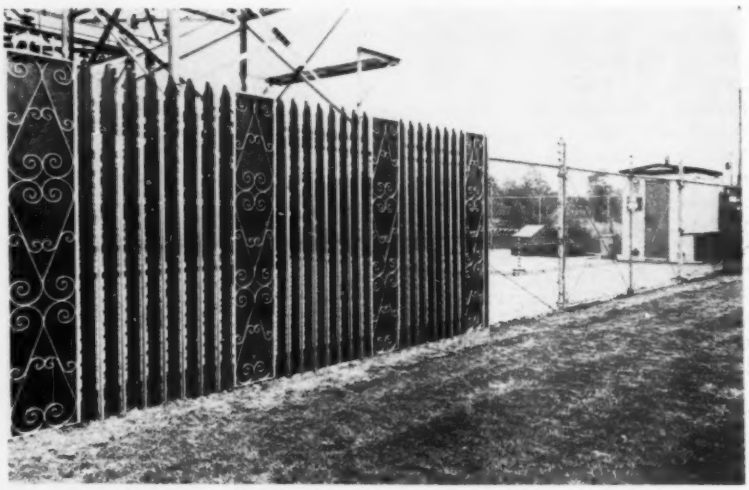
Maintenance-free enclosures for electrical substations

◆ ELECTRIC UTILITY interest in obtaining maintenance-free decorative enclosures for electrical substations has led to the introduction of an all-aluminum line of such equipment.

The new aluminum enclosures were displayed for the first time by the manufacturer, Hi-Voltage Equipment Co., Cleveland. Introduction of the aluminum enclosures by Hi-Voltage, a division of Joslyn Mfg. and Supply Co., follows by three months the original introduction of such equipment in enameled steel.

Utilities expressed enthusiasm for the product, but in several cases requested the material provide greater economy throughout the life of the structure by minimizing maintenance. Alcoa aluminum was Hi-Voltage's choice to provide this advantage.

Production of the aluminum enclosures by Hi-Voltage follows a long period of design research. The company started the project in an attempt to find a practical solution to the problem of economic and effective concealment of substations, which more and more are



Uncovered chain-link fence area at right shows typical substation fence, which must be extensively landscaped in a residential area. The new aluminum enclosures (one of five patterns shown at left), cost less than many plantings on a per-foot basis, and are maintenance-free.

NO TROUBLE CALLS WITH PUSHMATIC . . .

bolted connections are standard on every breaker

Trouble calls eat up your profits. But not when you install Pushmatic®—the circuit breaker that prevents overheating and subsequent nuisance tripping. You save costly call-backs and the difference goes right into your pocket. The reason?

Unlike plug-in type breakers, a Pushmatic *bolts* to a bus bar, cannot work loose and cause excessive heating. It provides a high-pressure, low-resistant, *positive* contact always.

No complicated installation, either. To install a Pushmatic simply tighten the handy captive screw onto the bus bar . . . and there it is, a truly trouble-free connection in seconds . . . and an end to a common cause of nuisance tripping.

Other Pushmatic plusses: Pushbutton convenience and control — quality you can depend on. More than a dozen individual tests are given each and every Pushmatic before packaging. The result is safe, proved performance *every* time. Sell Pushmatic and end trouble calls. © BEPCO

BULLDOG

BullDog Electric Products Company, Division of I-T-E Circuit Breaker Company, Detroit 32, Mich. *BullDog Export Division:* 13 East 40th St., New York 16, N.Y. *In Canada:* BullDog Electric Products Co. (Canada) Ltd., 80 Clayson Rd., Toronto 15, Ont.

Consult the following Southern representatives:

Wilson Electrical Equipment Co.
2930 Commerce St., P.O. Box 1725
Houston, Texas

Wilson Electrical Equipment Co.
101 E. Maple Street
San Antonio, Texas

Standard Electric Mfg. Company
2401 Federal St., P.O. Box 1138
Dallas 1, Texas

Walker Electrical Co., Inc.
125 Bennett St., N.W., P.O. Box 8, Station D
Atlanta, Georgia

being located in residential areas. Expense of a normal residential installation, involving plantings around a cyclone fence enclosure, runs up to $30 a foot for landscaping, plus costs in the $1000 a year per substation range for maintenance.

The new aluminum enclosures may be installed for less than the original cost of many planting programs, and carry to a maximum the low maintenance advantages of the new product. To all intents and purposes, the aluminum enclosures may be installed and forgotten, with assurance to the utility that it has minimized the problem of "living" acceptably amidst attractive residential areas.

The enclosures are so new, detailed installation cost figures are not yet available. Already evident is the fact that the much lighter aluminum enclosure sections may be erected with less labor than their steel counterparts.

Aside from their uniquely attractive appearance, the new enclosures have the special advantage of flexibility. Hi-Voltage is ready to "tailor-make" enclosures to customer design and color specifications. The "regular" line itself includes five basic types of designs, with various combination arrangements possible.

The enclosures consist of three basic components. Main section of the enclosure system is an 8-feet high by 4-feet wide picket unit. The primary design impact of the enclosure is provided by interim sections, measuring 8-feet by 1½-feet, offered in five designs. The third unit comprises assembly material, including top and bottom rails, upright posts, clamps, bolts, and corner fittings.

In a normal installation, the enclosures include two picket units for each interim section. Gates, where required, are supplied to order.

New overhead distribution system announced by Rome

◆ A UNIQUE OVERHEAD distribution system has just been announced by Rome Cable Corporation. Called the "Trimline" primary distribution system, it features a highly simplified Plexiglas supporting spacer, extruded high molecular weight polyethylene insulated phase conductors, and a high strength supporting messenger.

The Rome Trimline system, developed to keep pace with the trend to more economical overhead installations, is intended for both utility and industrial distribution circuits ranging from 5 to 15 kv.

The one-piece Plexiglas spacer, differing from others currently in use, offers its own distinct features. It has no mating or matching surfaces to create cracks or crevices which might collect water or contaminating substances. This in turn reduces the possibility of eventual arcing or shorting.

Each spacer is equipped with four "snap-lok" neoprene grommets (adapters). Special built-in compression rings in the grommets assure a snug spacer-to-cable fit. The constant pressure exerted upon the messenger and conductors restricts the spacer from "walking" or sliding from its original position on the line, thereby maintaining proper conductor spacing.

A single size spacer is used for all voltages up to 15 kv. This is made possible because of a 6-inch spacing between phase conductors and the interchangeability of the neoprene grommets. Grommets of different sizes are available to accommodate the various phase conductor and messenger diameters up to 15 kv.

The spacer itself is shaped somewhat like a diamond with rounded corners and smooth edges. Each of the phase conductors and the messenger are contained within the encompassing spacer unit when they are fitted into position. The messenger fits inside the top corner; the phase conductors inside the bottom and side corners. The spacer is securely locked at the bottom by a simple ring-type fastener. There are *no* nuts or bolts necessary to assemble the spacer unit.

While either copper or aluminum conductors are applicable, suggested standard phase conductors for the Trimline system are stranded hard-drawn aluminum covered with a high molecular weight polyethylene insulation. Rome's high molecular weight polyethylene is recommended by Rome engineers because of its excellent weathering properties and resistance to unusual environmental effects. This insulation is abrasion-resistant, light-weight, and has excellent electrical properties over a wide range of temperatures. (Other types of insulations may be furnished upon request.)

Phase conductor sizes for 5 kv circuits range from #4 AWG to 397.5 MCM, and for 15 kv circuits from #4 AWG to 266.8 MCM. Wall thickness of the high molecular weight polyethylene is 6/64" for 5 kv and 10/64" for 15 kv.

The standard messenger used with Rome's Trimline system is 5/16-30% EHS Copperweld with a rated breaking strength of 9,196 pounds. The messenger, attached to poles by an offset bracket, serves as a neutral for a grounded system. Galvanized steel or ACSR may also be used.

Spacers are placed approximately thirty feet apart along the entire length of the distribution system. The Trimline system can be installed in locations where additional circuits are required on one pole, where poles are too crowded for additional crossarms, where bad tree conditions are encountered, in alleyways where

Integral unit in Rome Cable's new aerial spaced cable package is "Trimline," a completely new, simplified spacer made of Plexiglas. To install, lineman opens the spacer bottom, pulls the unit over the messenger and cables, then closes and locks the spacer bottom. The messenger and cables are fitted with neoprene grommets, then pulled into place. The spacer can be installed or removed by one man without any special tools or equipment.

BIDS ALWAYS "ON THE NOSE" WITH UNIVERSAL LIGHTING DUCT

Exclusive BullDog features mean faster, easier installation that keeps costs competitive

Nothing makes it harder to figure lighting bids (particularly pipe and wire) than those unexpected—and expensive—changes you always run into after the job is started.

BullDog 20-amp Universal Lighting Duct licks that problem completely. You know in advance your final material and labor costs. So you can figure estimates—and profits—right "on the nose" before the job begins, instead of after it's over.

Changes in lighting arrangements during installation present no problem since you can tap in anywhere along the entire length of Universal Lighting Duct. Moving outlet locations, or rearranging the layout, can be done without costly and time-consuming rewiring. With BullDog, you just move the exclusive "twist-out" plug to the desired new location in a matter of seconds.

ULD is actually less expensive to install than pipe and wire, too, because it offers so many time-saving features . . . such as prefabricated parts . . . easily joined sections . . . choice of five installation methods . . . and the fact that it both feeds and supports the fixtures, thus eliminating the need for extra supports.

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Consult the following Southern representatives:

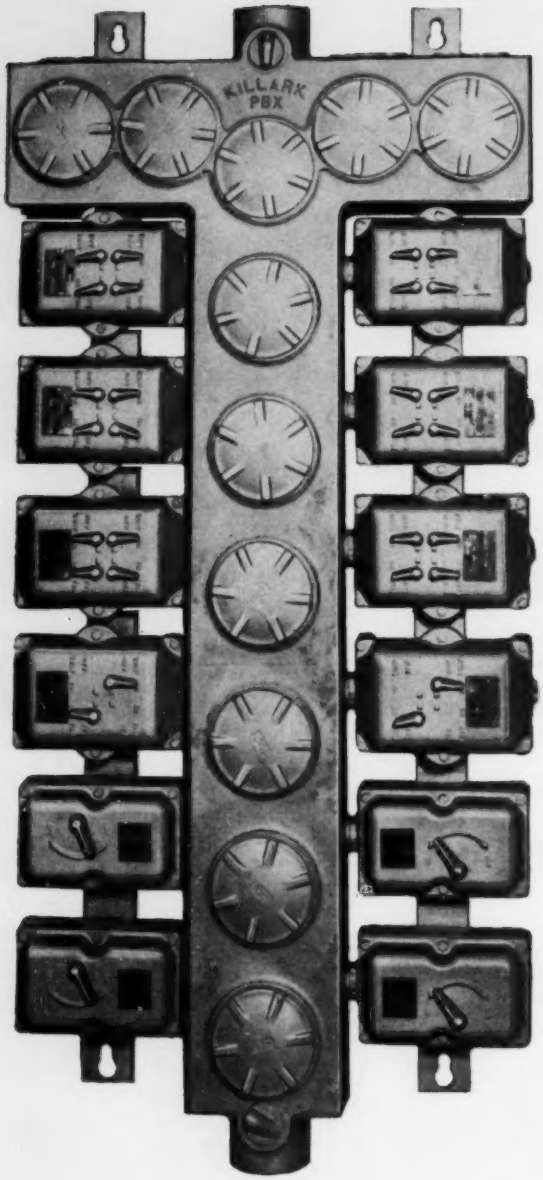
Wilson Electrical Equipment Co.
2930 Commerce St., P.O. Box 1725
Houston, Texas

Wilson Electrical Equipment Co.
101 E. Maple Street
San Antonio, Texas

Standard Electric Mfg. Company
2401 Federal St., P.O. Box 1138
Dallas 1, Texas

Walker Electrical Co., Inc.
125 Bennett St., N. W., P. O. Box 8, Station D
Atlanta, Georgia

New Explosion-Proof *Aluminum Construction*

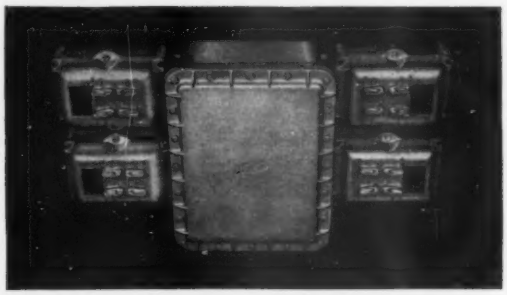


EXPLOSION-PROOF PANEL BOARDS

Now available from Killark! Made to your "specs," completely wired, ready to install. We'll include the breaker of your choice. Available in either screw-cover or bolt-on cover types, in rectangular or "T" style wiring trough. Cast aluminum for rugged, light weight and smooth, safe operation. Roomy cover openings assure plenty of hand room. All seals and connections are included, as well as mounting brackets.

Explosion-proof PANEL BOARD (screw cover)

Panel illustrated contains 32 circuits: top 3 breaker boxes on each side contain 4 single-pole breakers each, 4th box from top on each side contains 2 double-pole breakers each, bottom 2 on each side contain 1 three-pole breaker each. Comes completely wired. Contractor has only to pull main and take off branch circuits from connection block. Wiring trough is produced in one piece to eliminate sectional joints, increase safety.



Explosion-proof PANEL BOARD (bolt-on cover)

Preferred on some jobs for small panels. Available for hazardous as well as all-weather areas. Hinged cover is another available feature.

Killark

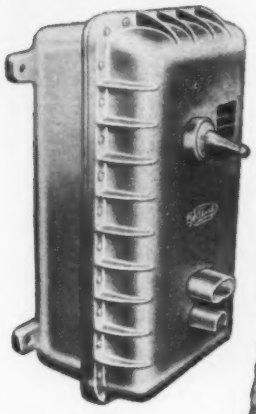
KILLARK ST. LOUIS

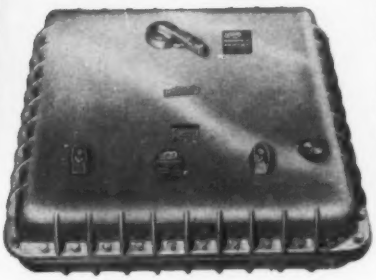
ELECTRIC MANUFACTURING COMPANY

Vandeventer and Easton Aves. St. Louis 13, Missouri

Items from Killark

...Big in Selection...Big in Safety!





EXPLOSION-PROOF MOTOR STARTER ENCLOSURES

Designed for your next job calling for motor control equipment. Guaranteed to please you. Made of popular lightweight cast alumalloy—strong and carefully machined for ease of operation and long, trouble-free service. We'll include starter of your choice.

XMS SERIES STARTER

Designed to incorporate standard magnetic across-the-line starter equipment including sizes 0, 1, 1½, 2, 3, 4 and 5.

XMCS SERIES COMBINATION STARTER

Available with starters 0 through 5 with protective circuit breaker or disconnect as required.

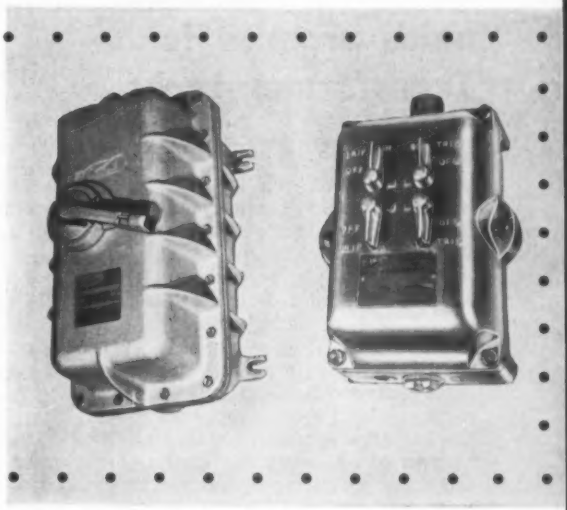
EXPLOSION-PROOF CIRCUIT BREAKER ENCLOSURES

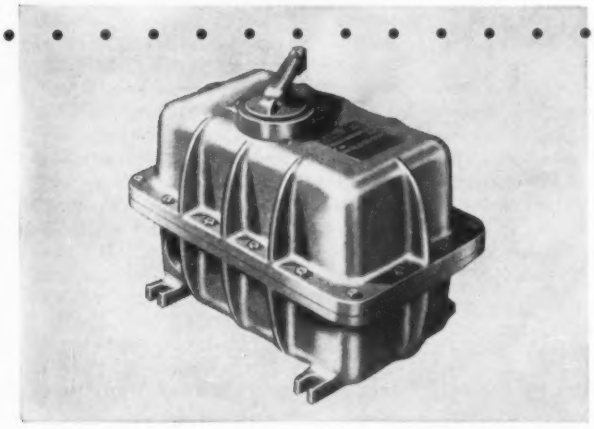
Complete line includes dust-tight and weather-proof as well as explosion-proof breakers. Modern, lightweight cast aluminum. All sizes through "LM" Frame. Easy-action handle assembly for smooth, positive operation. Breakers included.

Modern, lightweight cast aluminum housing that requires no maintenance and meets the most exacting installation needs.

XCB Series Breaker Enclosures—All sizes complete through "LM" Frame. We include breakers. Easy-action handle assures smooth, positive operation. Lockout included.

XPCB Series Breaker Enclosures—Will accommodate 4 single pole "quicklag" type breakers, or 2 double pole, or 1 three pole, or any combination not exceeding 4 poles. Amp. ratings through 70 amp.





EXPLOSION-PROOF DISCONNECT SWITCHES

A long-felt need in the electrical industry will be filled by this complete line of disconnect switches (Series XDS). They are available with or without solid neutral, fuseable and non-fuseable, all with convenient mounting lugs. Constructed of lightweight, non-rusting, non-corroding aluminum, they offer a full range of hub arrangements and conduit sizes.

WE WOULD APPRECIATE THE OPPORTUNITY OF BIDDING ON YOUR NEXT JOB

KILLARK REPRESENTATIVES

ATLANTA—Ernest T. Loyd, Inc., 69 Mills St., N. W., Atlanta 8, Georgia
BALTIMORE—Eastern Sales Co., 1561 Lister Rd., Baltimore 27, Maryland
CINCINNATI—Arthur L. Ehlers Co., 1031 Meta Drive, Cincinnati 37, Ohio
DALLAS—Geo. T. Anderson Co., 1901 Griffin St., Dallas 2, Texas
RICHMOND—W. E. Sullivan, Jr., 6211-A West Broad St. Rd., Richmond 26, Virginia

space prohibits use of crossarms and especially where a compact and neat-appearing distribution system is necessary.

The Rome Trimline primary distribution system offers the following advantages over open-wire construction, the manufacturers say:

1. High-strength supporting messenger provides storm damage protection.
2. Eliminates need for additional crossarms.
3. Simple to install, splice and terminate even when "hot."
4. Longer spans possible—system weights permit spans to 300 feet without overloading the pole with excessive tensions.
5. Reduced tree trimming costs where heavily wooded areas are incurred.
6. Lower reactance than conventional open-wire results in better voltage regulation.

J. C. Warford, (left), manager of the electrical equipment market for Reynolds Metals Company shows first distributor transformer housing made from aluminum extrusions to David P. Reynolds, executive vice-president in charge of sales.

Extruded aluminum holds promise for Transformer tanks

◆ DEVELOPMENT of an aluminum distribution transformer housing easily manufactured from extrusions has been announced by Reynolds Metals Co., Richmond, Va.

The extruded sectors, which have ready-made fins for dissipating heat, are applicable to the 25 kva and larger transformer sizes, according to J. C. Warford, manager of the electrical equipment market for Reynolds. The extrusions incorporate lifting lugs, hanger attachments, and core and coil supports.

He said the development is the first breakthrough into a potential 25-million-pound-a-year-market for aluminum. The aluminum tank, according to Mr. Warford, weighs less than one-third of its steel equivalent.

"This makes it easier, safer and more economical to install the transformers on poles, and also results in a reduced weight load on the poles themselves," Mr. Warford said.

"The new housing provides more efficient cooling because of aluminum's unique heat conductivity and the fact that through the extrusion process, the fins become an integral part of the tank and are not merely welded to it," he stated.

The rust-free aluminum tanks also will achieve substantial savings in painting and maintenance costs, Mr. Warford pointed out. Tests thus far, he said, indicate that the aluminum tanks also should lower noise and magnetic losses.

He pointed out that the aluminum tanks will be much easier to manufacture than steel tanks since the extruded sections can be automatically welded at great speeds. In producing conventional steel housings, he said, the tank itself must first be welded, then each of the fins laboriously welded to the housing.

Because of manufacturing, installation, shipping and other savings, the total over-all cost of the aluminum transformers will be competitive with that of conventional steel housings. He said the advantage of aluminum will be even greater for the larger transformer sizes.

Helicopter speeds line inspections

◆ A HELICOPTER hovers at tree-top level up and down the mountainsides of western Maryland, Pennsylvania and West Virginia. It pauses momentarily, then continues its flight. The whirlybird carries a pilot and an inspector who are checking power lines of the Potomac Edison system and other utilities.

A man, walking an average of 10 miles a day, would require 15 five-day weeks to cover 685 miles of Potomac Edison transmission lines, according to Alan F. Secor, official in charge of line inspection for the utility. "By helicopter it takes just five and one-half days," he said, "and it is far more economical." The pilot's main job is to keep the 'copter as close to the power lines as possible, 25 to 30 feet to the side and above the conductors. He must do this while always following regulations of the Civil Aeronautics Administration.

The inspector checks conductors, structures and their equipment. He dictates his findings into a recorder and maintains two-way radio contact with ground stations. He reports such conditions as lightning shattered poles, split, broken or rotted crossarms, broken wires, missing nuts and bolts, dangerously close trees and broken insulators. In addition, he often sees such potential troublemakers as bird's nest holes which weaken poles.

Rain and fog slow down but do not stop the air patrols. But the helicopter has not eliminated

(Continued on page 111)

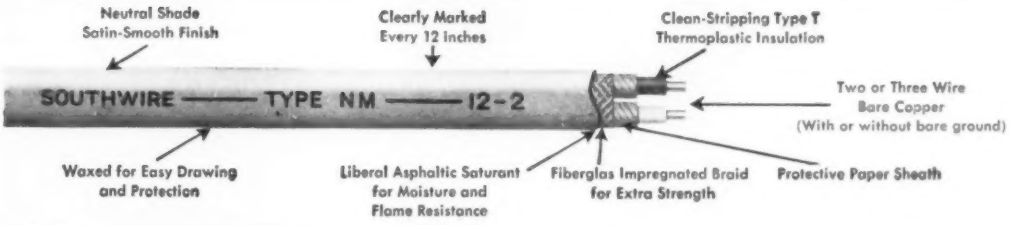
NOW.....

A SOUTHERN SUPPLIER FOR SOUTHERN WHOLESALERS

Southwire type NM SHEATHED CABLE

Made to National Electrical Code Specifications, and UL approved, Southwire Type NM Sheathed Cable is the answer for low cost wiring up to 600 volts. A full range of sizes—from 14/2 to 4/3, with or without ground wire—is available. It is packaged in cartons, coils, or on reels to customer's specifications.

Order Southwire Type NM Sheathed Cable and get Southwire Service — fast deliveries direct by our own trucks.



- Bare and Weatherproof Copper and Aluminum Line Wire
- Neoprene, Polyethylene, and VWP (Vinyl) Weatherproof Copper, Aluminum and Triplex
- U.R.C. (DBWP, TBWP) Copper
- Copperweld® Conductors
- Copper and Aluminum Building Wire
- ACSR and All Aluminum Cable
- Galvanized Steel Guy Strand and Static Wire
- Aluminized Steel Guy Strand and Static Wire
- Aluminum Alloy Wire
- Cable Accessories
- NM Sheathed Cable

- ALSO FABRICATORS OF COPPER AND ALUMINUM FOR WIRE AND CABLE MANUFACTURERS

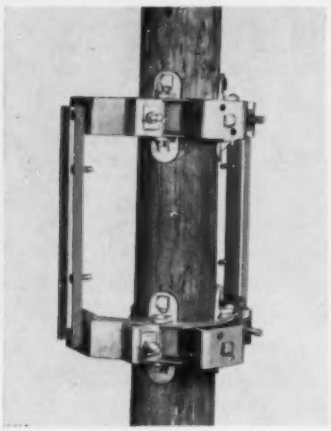
Southwire Company

Carrollton, Georgia — TErrace 2-6311

Notes on new utility equipment

Mounting brackets simplify multiple installations

NEW POLE-BAND transformer cluster mounting brackets and accessories have been recently authorized for production by Line Material Industries, McGraw-Edison Co., Milwaukee 1, Wis. These mounts simplify



multiple installations of one, two, or three single-phase transformers on one pole, and they can accommodate transformers rated 3 through 167 kva. The keyhole slots in the bearing plates facilitate mounting by one man. A welded box-channel construction and galvanized parts insure high strength and long service life.

The cluster mounting brackets are adjustable to pole diameters of 7½ to 12 inches, and they meet EEI-NEMA standards for physical and electrical clearances.

Write U-101 on reply card, page 19.

New parallel connectors are easily installed

A NEW LINE of aluminum compression parallel connectors, called KPD and KPO "Press-On", has been

announced by Penn-Union Electric Corporation, 315 State St., Erie, Penn. The parallel connectors hook on the run conductor quickly and easily for simple two handed installation, either hot or cold. A built-in spacer prevents mechanical damage to the conductors from strand cutting. The spacer also minimizes cold flow in aluminum to aluminum joints and corrosion in aluminum to copper joints. There are no tabs to bend. A solid wall of metal on the top of the connector completely wraps the run conductor preventing corrosion products from entering along the axis of the conductor.

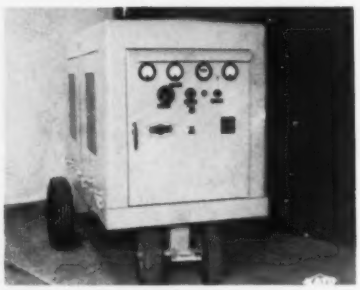
Twenty-three sizes of "Press-Ons" accommodate #6 solid - 4/0 ACSR aluminum to aluminum or aluminum to copper. A very important feature of this line is that it can be installed in existing hydraulic or mechanical crimping tools with standard dies such as "D" and "O".

Constructed of pure aluminum the "Press-On" will be factory etched and coated to insure oxide free contact surfaces. They will also be prefilled with Cual-Aid joint compound to make certain inhibitor is used during installation.

Write U-102 on reply card, page 19.

Trailer mounted frequency converters developed

KATO ENGINEERING Company, Mankato, Minnesota, has developed several sizes of fully housed trailer



mounted power converting motor-generator sets.

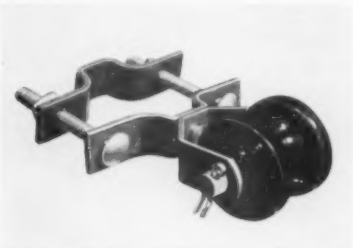
One of these units consists of a revolving field, 20 kw, .8 pf, 25 kva, 115-volt, single phase, 400 cycle alternator mounted on a single shaft within a common frame with a 40 hp, 60 cycle, 440-volt, 3-phase synchronous motor. The unit operates at 1200 revolutions per minute and produces exactly 400 cycle alternating current regardless of load changes providing the input line remains constant.

Controls and indicating meters for both motors and generators are mounted in the dead front hinged door of the housing. Similar sets have a suitcase type remote panel which fits into the door and can be moved to a nearby test station. Other units are supplie ' with remote control subpanels.

Write U-103 on reply card, page 19.

Insulator bracket utilizes wet-process porcelain

HEAVIER SERVICE entrance drops can be tied to service masts using the new insulator bracket from M & W Electric Co., Inc., East Palestine, Ohio. The spool-type insulator utilizes wet-process porcelain to withstand heavier abuse. Mounting for the spool



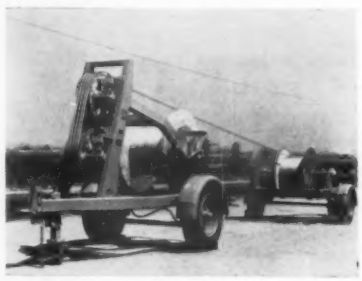
is a ½" removable pin, permitting easy insulator replacement without discarding the complete fitting. In addition, the pin-mounted insulator reduces vibration transfer to the mast and improves dependability.

Write U-104 on reply card, page 19.

Tension stringing assembly complete, moderately priced

A MODERATELY priced, complete tension stringing assembly has been announced by Petersen Engineering Co., Inc., Santa Clara, Calif.

This assembly consists of a complete tensioner with its pair of neo-



prene lined bullwheels, its own reel-carrying device for paying out the conductor under controlled tension, and the new Pengo 5400 CP - TR cable puller which operates at the other end of the stringing operation to pull in the conductor by means of a pulling line of any kind. Only one

man is required at each end of the line to operate each unit—giving complete control of the stringing and affording the maximum safety with the minimum of men and equipment.

The new Pengo 5400 CP-TR cable puller pulls directly onto a reel and consequently is designed for relatively light construction work and is rated at speeds up to 3 miles per hour and tensions to 1000 pounds line pull.

Write U-105 on reply card, page 19.

Weathercasing among largest porcelain pieces ever made

THE FIRST ONE-PIECE 345-kv bushing weathercasings from the Westinghouse Electric Corporation's porcelain plant in Derry, Pa., was recently received by the company's power circuit breaker department in

East Pittsburgh, Pa. These weathercasings, among the largest electrical porcelain pieces ever manufactured, measure 102⅞ inches long and 29¾ inches at their largest diameter.

These one-piece units replace previous two-piece weathercasings in which two porcelains were mechanically assembled together into a single unit.

Write U-106 on reply card, page 19.

Photoelectric streetlight control simplified

THE ACME WIRE CO., 1233 Dixwell Ave., New Haven, Conn. has developed a new simplified photoelectric streetlight control. It has no vacuum tubes, no transistors, and no transformers. One basic unit will handle all photoelectrically controlled lighting requirements when combined with its series of auxiliary equipment.

It is designed for use with incandescent, mercury vapor, or fluorescent lighting fixtures, and does not require north-light orientation. Being inoperative during daylight, it draws practically no current.

The engineered simplicity of the "Lamplighter" means that original installation is less expensive and maintenance costs are minimized.

Operating light level can be adjusted from 1 footcandle to 6 footcandles

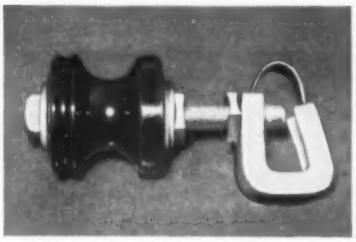
for turn-on. Ratio of turn-off level to turn-on level is less than 2. Time delay is 4 seconds in relation to turn-off value.

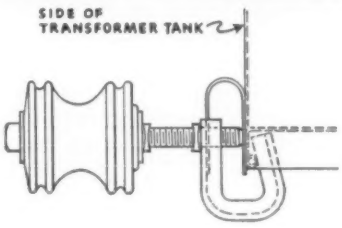
External sensitivity adjustment can be regulated with the unit in service. Relay load contacts are rated at 10 amperes. The unit can be supplied with either twist-lock or 3 prong straight pull base plug.

Write U-107 on reply card, page 19.

Secondary lead bracket quickly and easily applied

OLIVER ELECTRICAL Manufacturing Co., 170 Angell Street, Battle Creek, Mich., is now manufacturing a new transformer secondary lead bracket.





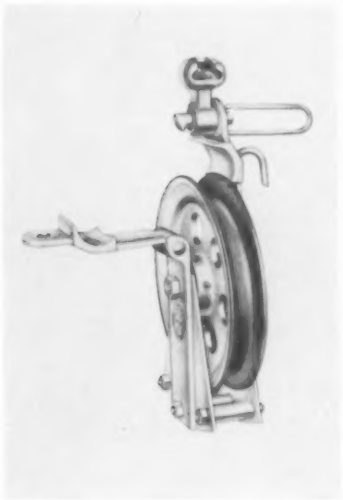
The quickly and easily applied bracket locks firmly to the bottom rolled edge of the transformer tank, providing a solid support for secondary leads.

A stainless steel clip between bolt end and transformer tank prevents the bolt from damaging transformer paint. The bracket is furnished assembled with wet process 3-inch brown glazed insulator. The heavy formed channel and other metal parts are hot dip galvanized.

Write U-108 on reply card, page 19.

Conductor stringing sheave has bonded Neoprene lining

SHERMAN AND REILLY, Inc., First and Broad Sts., Chattanooga 2, Tenn., now offers for use in overhead transmission and distribution line con-



struction a new conductor stringing sheave with a permanently bonded Type GNA Neoprene lining.

The Neoprene is permanently bonded to the aluminum alloy sheave by a vulcanization process. The result is a smooth, resilient lining for protection of the aluminum conductor and good abrasion resistance to the wire rope pulling line. Type GNA Neoprene also offers good resistance to lubricants and to extreme weather conditions.

This product has been proved in both laboratory and actual field tests. Many miles of wire rope and aluminum conductor have passed over these sheaves without any noticeable wear.

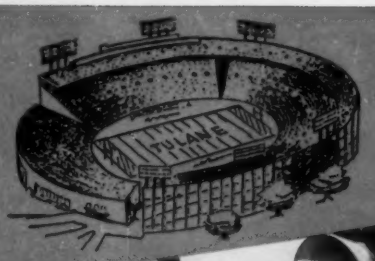
Write U-109 on reply card, page 19.

Shipping time cut in half for capacitor equipment

A 50 PER CENT reduction in shipping time for aluminum rack pole-top and open substation capacitor equipments has been announced by General Electric's Capacitor Dept., Schenectady 5, N. Y.

Under normal circumstances, General Electric now starts delivery of factory-assembled, pole-top equipments for distribution feeders within two or three weeks from receipt of order at the department's plant.

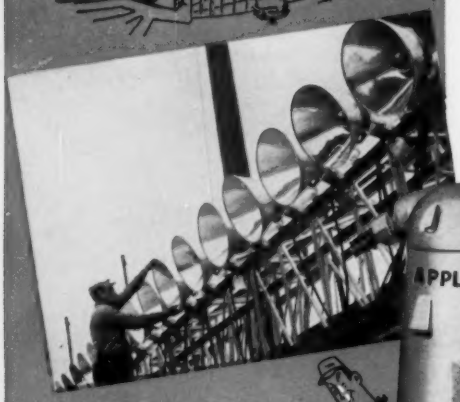
Previous shipping time for these equipments were galvanized steel



When Tulane goes "Light Conscious" the choice is . . .

APPLETON®

INTENSO Trade Mark FLOODLIGHTS

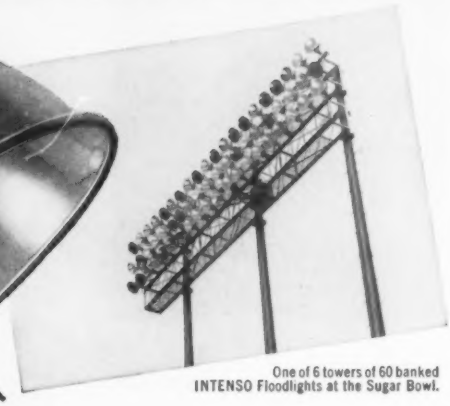


Workman at Sugar Bowl checking INTENSO light before bank is raised to tower height.

Photos courtesy of Tulane University

Mario Zervigon and Associates, Consulting Engineers

Opens for Split-Second Rear Relamping



One of 6 towers of 60 banked INTENSO Floodlights at the Sugar Bowl.

Outstanding Features of APPLETON INTENSO FLOODLIGHTS

- Sights like a rifle to assure easy positioning . . . even in daytime
- Calibrated 360° horizontal and 100° vertical adjustment for hair-line positioning
- Easy to service . . . release 3 flip clamps and back of lamp swings up and locks in position for re-lamping
- No need to re-position floodlight after servicing
- Entire interior accessible from rear for easy cleaning
- Rear section repositioned automatically in sealing ring groove . . . equalized pressure against impregnated asbestos gasket protects against rain, ice, snow
- Exclusive louver ventilation provides lower operating temperature for longer lamp life
- Entire servicing job done without tools . . . in seconds

"Always Daylight" Illumination Scores A Touchdown for Everyone at the New Orleans Sugar Bowl

■ Unlighted for 30 years, the choice of lighting experts, maintenance and financial men at Tulane for illuminating the Sugar Bowl was APPLETON INTENSO Floodlights! Because only APPLETON-engineered INTENSO provides the accurately planned high intensity illumination, ease of servicing, cleaning, re-lamping, and positioning that gives maximum trouble-free, year-round lighting. Write for full information on the complete line of APPLETON Alzak Aluminum Floodlights!

Sold Through Franchised Distributors Only

APPLETON ELECTRIC COMPANY
1701 Wellington • Chicago 13, Ill.

Also Manufacturers of:

Explosion-Proof Fixtures

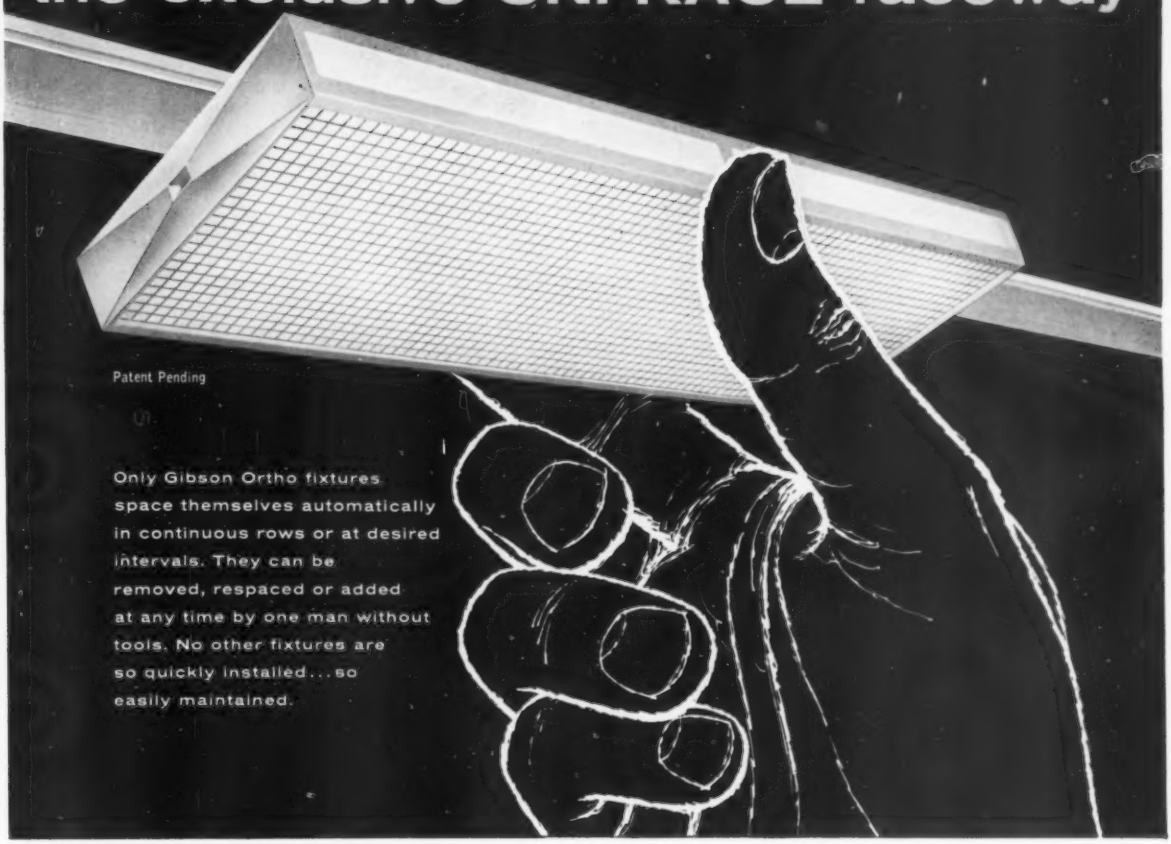
Malleable Iron Unilet Fittings

Industrial Lighting

"Eagle Claw" Switch Boxes

GIBSON ORTHO 66

the fixture that just plugs in on the exclusive UNI-RACE raceway

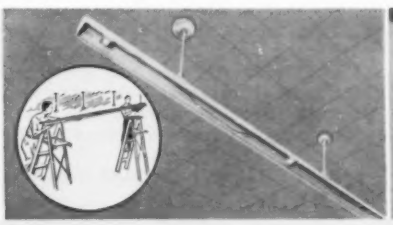


Patent Pending

Only Gibson Ortho fixtures space themselves automatically in continuous rows or at desired intervals. They can be removed, respaced or added at any time by one man without tools. No other fixtures are so quickly installed... so easily maintained.

installation quick and simple

1 Uni-Race, U.L. approved raceway of 225-amp capacity, is assembled and wired on floor.



2 Light, rigid Uni-Race assembly up to 48' easily lifted and hung.

3 Fixtures simply snap into place. Plug in fixture engages receptacle in Uni-Race.

WRITE FOR COMPLETE INFORMATION ABOUT THE GIBSON ORTHO LINE

Gibson LIGHTING

GIBSON MANUFACTURING COMPANY

1919 PIEDMONT CIRCLE, N. E. ATLANTA 9, GEORGIA

Manufactured in Canada under franchise by Electroller Manufacturing Co., Ltd., Montreal

racks was six weeks. Delivery time for factory-assembled, stack-rack equipments has been reduced from 12 to 6 weeks.

According to L. P. Hart, Jr., department manager of manufacturing, the reduction in manufacturing and shipping cycle has been made possible because the company can now stock large quantities of aluminum angles and channels, and quickly fabricate its own racks.

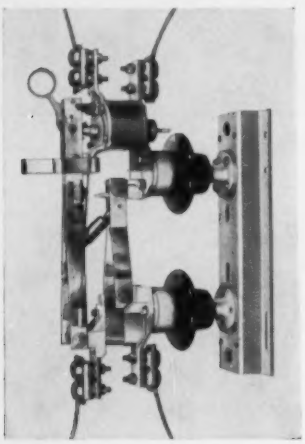
"In addition," he said, "the lightness and workability of structural aluminum, and the elimination of the time-consuming galvanizing process necessary with steel racks are responsible for reducing the shipping cycle for these equipments."

Write U-110 on reply card, page 19.

Regulator by-pass switch economical, easy to install

THE RT REGULATOR by-pass switch, manufactured by the A. B. Chance Co., Centralia, Mo., is a single unit that performs all three steps required in removing a voltage-regulator from the line: (1) by-passing, (2) disconnecting, and (3) interrupting exciting current. This switch meets all applicable AIEE and NEMA specifications, including those for high momentary currents in both by-pass and closed positions. This new switch is available in 400- and 600-ampere ratings at 7.5, 15, and 23 kv.

The 3-step sequence occurs automatically as the dual blade is moved to the full-open position. Pulling down on the pull-ring disengages the blade latch and pulls the shunt bar into by-pass position between the



shunt contacts, which are housed in the horseshoe-shaped insulator. With the regulator now by-passed, the dual blade continues to travel, opening both disconnects. As the blade travels on, the snap-out arcing horn whips open to interrupt the exciting current, and the blade comes to rest in the full open position. In reclosing, the sequence is automatically reversed.

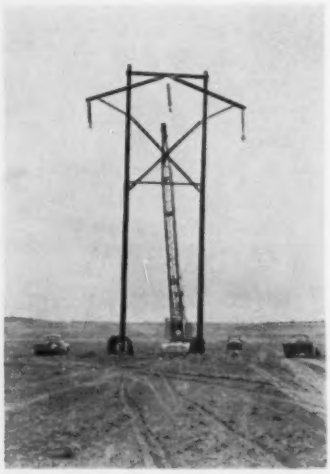
The reverse-loop shunt contacts are of hard-drawn, 98 per cent-conductivity copper, with press-fit coin-silver buttons. Blade-jaw and blade-hinge contacts are silver-to-silver.

Since it is easier to install, requires less installation labor, and takes up less space, the single-unit Chance RT regulator by-pass switch is more economical than a comparable installation of single-throw disconnects.

Write U-111 on reply card, page 19.

Spreader bar features three lifting eyes

A SPREADER BAR for setting H-frame structures has been announced by Petersen Engineering Co., Inc., Santa Clara, Calif. The new PENGO spreader bar makes it



possible to set H-frame structures of any size poles and any pole spacing with any kind of crossarms—even double spar arms—and with or without X braces, and complete with insulators and stringing sheaves.

The new PENGO spreader bar lowers itself automatically from the structure after it is set, so that it is not necessary for a man to go up the poles at any time until time to clip in the conductor.

Among the additional features of the PENGO spreader bar are three different lifting eyes, permitting the setting of structures with heavier or longer poles on one side than on the other.

Write U-112 on reply card, page 19.

Ground-trip solenoid for low-current response

INCREASED sensitivity to ground faults is provided by a new current transformer and ground-trip solenoid combination for use with Kyle Type R and W reclosers. The new unit is available from Line Material Industries, Milwaukee 1, Wis.

Zero-sequence currents of 25 amperes or more can be detected so reclosers can now protect circuits and equipment from low-current ground faults in addition to high-current, phase-to-phase faults. De-energizing circuits having ground faults affords improved safety for line crews and other persons. Reclosers with these accessories are especially applicable on uni-grounded systems, with loads connected phase-to-phase.

Sensing of fault currents is achieved by a special three-phase Type TR current transformer having a fixed turns ratio of 60:5.

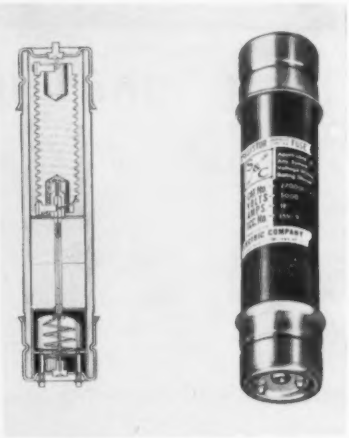
The ground-trip solenoid is designed for low-current response. Four delayed inverse time-current curves enhance coordination with reclosers, fuses, and oil circuit breakers. Tripping operations can be all fast, all delayed, or a combination sequence can be selected.

Write U-113 on reply card, page 19.

New fuse designed to fit all mountings

S&C ELECTRIC Co., 4435 Ravenswood Ave., Chicago 40, Ill., has introduced a new universal current limiting fuse which will take care of most indoor potential transformer needs at 14.4 kv and below. It is marketed as the S&C Fusitor Current Limiting Fuse.

The new fuse can be called a universal device not only because it is designed to fit all mountings, but also because it is not downward-voltage-critical. For instance, the 14.4 kv unit will take care of all system voltages down to 2.4 kv without impairment of its interrupting ability and without inducing excessive transient overvoltages during interruption. This is to be contrasted with ordinary current-limiting fuses which must be applied between 70 per cent and 100 per cent of nameplate voltage rating.



The Fusistor can render this kind of performance because of the inherent operating characteristics of its current limiting section which uses a helically coiled molybdenum wire, in turn helically coiled on a ceramic core, embedded in silica sand.

Write U-114 on reply card, page 19.

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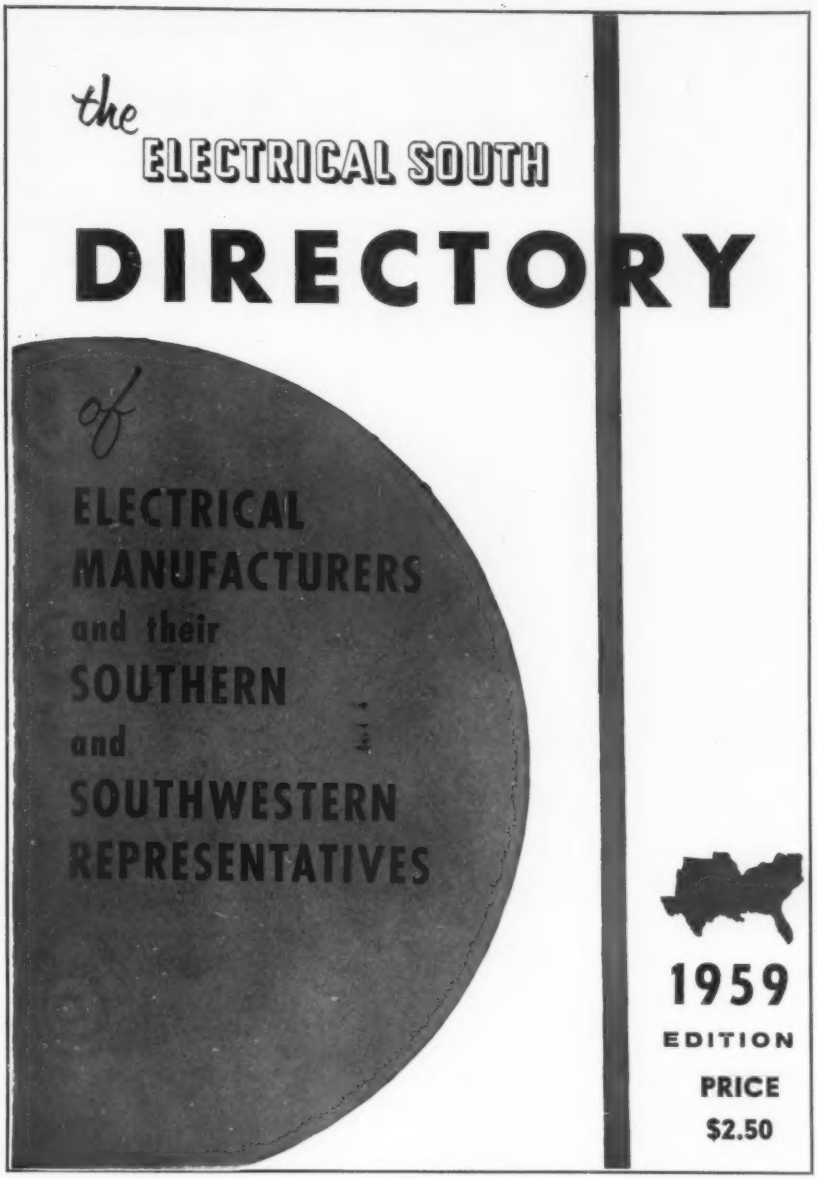

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Articles are wanted in two principal classifications:

Wiring and Lighting: **Articles on interesting and unusual electrical installations; any phase of electrical contracting such as business promotion, estimating, handling men and materials, etc.**

Utility Engineering: **Articles relating to any phase of transmission, distribution, and metering, including design, installation, testing, and maintenance. These articles should be "by-line" articles carrying the name of a Southern or Southwestern light and power company.**

All articles will be given careful consideration and payment will be made promptly for all material accepted for publication.

Address all communications to the editor:

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Contractors tell how

Preventive maintenance helps insure profit from power tools

By Clayton Gasque, Jr.
General Superintendent
Hitt's Electrical Service, Inc.
Rockville, Md.

It takes only 15 minutes per fixture installation when the fixture snaps on ceiling channel and ballast fastens on topside of channel.

Fishtape is being fed through conduit with an electric cable puller.

◆ IN PRESENT-DAY contracting labor saving tools are a must. In order to carry out jobs in a minimum of time and make a profit, your labor saving equipment becomes an important means of remaining competitive.

We number among our important time savers our pipe cutter, Whitney punch, hydraulic pipe bender, electric hammer, portable generator on jobs where drills are hooked up and there is no available electric power, portdrive, automatic cable puller, steel scaffolding, hydraulic knockout set, electric and acetylene welder, metal brake, Remington gun, and electric bayonet-type saw. With the major portion of our jobs commercial and industrial, we generally take on jobs for which we already have tools or for which tools can be purchased within a reasonable range of what the job will bring. If rented tools are available, we prefer renting to buying. For example, where jobs require it, we rent cranes and ditch diggers with their operators.

Equipment inventory

We control our $10,000 tool and equipment inventory by means of a card system with an individual card for each piece of equipment. On this card we enter name of the tool, description, size, estimated value of tool, job to which it is charged, when it was issued, date it was returned, and on recent tools the manufacturer's name and list price.

The job foreman is responsible for the return of the tool, whether or not he or one of his mechanics signs for it.

Tools are charged to a job if bought specifically for that job. On subsequent jobs employing the tool, cost is absorbed. All tools pay for themselves within a short time because time and labor savings are so great.

Tools brought in from jobs are checked for operation, cleaning or greasing, and checked again before they leave the shop. A defective tool found on a job is reported to the warehouseman who is in charge of maintenance. A minor defect is corrected on the job.

An important factor in preventive maintenance is mechanics' training in the handling of tools. The operation of a new tool introduced on a job is explained and demonstrated and its initial handling by a mechanic supervised before he is put on his own with it. Safety can be assured only when this procedure is observed. The mechanic's skill in handling tools means longer tool life and lower costs in repairs.

Labor saving tools and equipment make an important contribution to job profits.

Are your foremen supervisors or super-mechanics?

By Si Bell
President
Sarasota Electric Corp.
Sarasota, Fla.

◆ SOME QUESTIONS should be considered when the contractor needs a foreman or superintendent. For instance, just what does such a man need to be fitted for the job?

Does he need to be fully conversant with the kind of wiring his firm does, to the extent of being able to perform any operation better than any of the firm's journeymen, or should he be expected not to fill the role of a super-mechanic, but just to concentrate on being a skilled administrator of the boss's policies?

Should he be a good judge of men and materials and accepted wiring practice from the standpoint of mixing these ingredients together most efficiently, to consummate a job at the highest profit to his employer?

From my experience, I feel that a foreman does not have to know more than any of his men. Presumedly they know their job. The man selected as foreman is no different from anyone else who has the ability to supervise. This quality is not developed; not all of us can be leaders and direct others to do a good job. It takes a special "something" to accomplish this.

A foreman needs to be a super-mechanic only in that he possesses a common-sense knowledge of the trade and that he can tell men how best to do their work. Of equal importance is that he has the quality of leadership and initiative and will assume responsibility for his judgment and decisions.

Let's say that it rains half an hour ahead of quitting time. Should he knock off a dozen men for that half-hour, saving 6 man-hours, or should he work them in the rain in order to make the job ready against the momentary arrival of concrete destined to cover up an unfinished conduit run? Again, if he sees that working men overtime for an hour will clean up a job and save bringing a crew back the next day, it is up to him to make that move which is the most practical and profitable.

Proponents of mechanical know-how claim this is the most important qualification of a foreman. In my opinion, a foreman's skill should be managerial and transcend his mechanical proficiency.

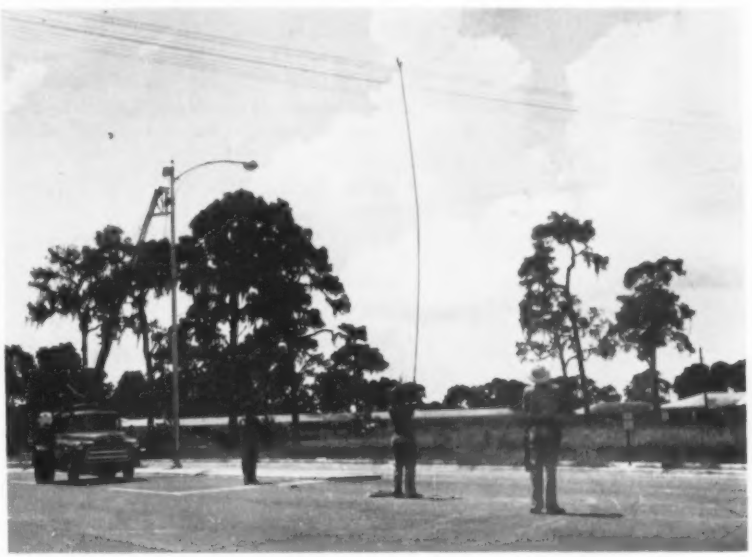
In the case of the contractor who handles large jobs, supervision can make or break him by its attitude and answers to the countless problems and questions that arise in carrying out the firm's policies and procedures as they apply to human relations on the job, and these include the foreman's attitude toward his men as well as workers of other trades on the job.

The importance of human relations goes up the scale with the importance of the job. True, promotion from mechanic to foreman is based upon mechanical skill and performance, but when a man gets up to supervisory levels, when he stops handling tools and starts handling people, an almost total reversal of qualifications begins.

The very nature of his position should indicate to the foreman that he is paid to get the work done—not to do it all himself. Any mechanical ability is more a matter of smart allocation and assignment to others. It's easy to see that any foreman or superintendent is going to have a tough time handling a group of journeymen if he is forced to set himself up as a super-duper expert, spending plenty of time experting and not enough time supervising.

The foreman's responsibility, as a representative of his boss, is to be an effective leader of his crews. People are seldom as predictable as wiring materials, wiring practices, or electrical circuits.

The engineer may not understand human relations; the foreman must. Hence emphasis must be placed on this important phase of the make-up of the foreman.



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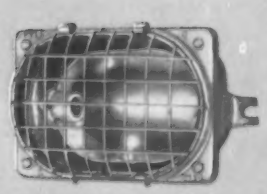

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Understanding the Code

By Walter R. Stone

This article should be especially helpful to the following readers:

- Electrical Contractors ✔
- Electric Utilities ✔
- Electrical Wholesalers ✔
- Electrical Inspectors ✔
- Industrial Engineers ✔
- Consulting Engineers ✔

◆ ARTICLE 250 of the Code on grounding has supplied ammunition for a good many word battles, many of which have resulted in improved safety standards. But these standards must be understood and properly applied in order to achieve the intended safety. There are conditions under which poor grounding can result in hazards.

The Code specifies *what* is to be grounded, *when* it is to be grounded *where* it is to be grounded, *how* it is to be grounded, and *why* it is to be grounded. The only thing not mentioned by the Code is *who* will do it. (*When*, of course, is used in the sense of meaning *under what conditions* and *not* as a factor of time). *Who*, although left out of the Code, is nonetheless the most important factor, because that word *who* will determine whether or not the grounding is done correctly and safely.

Of the other factors, it seems wisest to me to start with the *why*. If the importance of the *why* can be adequately explained first, there will be more incentive for the *who* to carry through meticulously with the *what*, *when*, *where*, and *how*.

Since there are two distinct elements of grounding—(1) system grounding, and (2) equipment grounding—it is best to consider the *why* of each of them separately. Section 2511 states, "Circuits are grounded for the purpose of limiting the voltage upon the circuit which might otherwise occur through exposure to lightning or other voltages higher than that for which the circuit is designed; or to limit the maximum potential to ground due to normal voltage." By the term "circuit" the Code has reference to what is normally referred to as "system" grounding.

System grounding

By system grounding is meant a connection to ground from one of the current-carrying conductors, usually the neutral. By the term "ungrounded system" is meant a system which has no such intentional connection to ground except possibly through a potential indicating meter, such as a ground detector. In reality, however, an ungrounded system is "capacitively" grounded in that the conductors act as one side of a condenser, and the ground acts as the other side.

Besides being subject to greater overvoltages as a result of lightning, these ungrounded systems are subject to damaging transient overvoltages. Normal switching of a circuit which has a ground fault can result in overvoltages of several times normal, and so can restriking of such ground fault arcs. These overvoltages can cause multiple insulation failures and fires.

System grounding provides greater protection against lightning damage, protection against overvoltages of either a transient nature or of those resulting from actual physical contact with outside overhead primaries; it provides superior fault protection, and safety for personnel and equipment as well as safety for property, such as

---

Code test questions

1. Circuits are grounded for the purpose of preventing a potential above ground on the equipment. True or false?

2. All 2-wire d-c systems are required to be grounded regardless of voltage. True or false?

3. The neutral conductor of all 3-wire d-c systems supplying interior wiring shall be grounded. True or false?

4. D-c wiring systems which are to be grounded shall have the grounding connection made at each individual service. True or false?

5. Electric furnace circuits need not be grounded. True or false?

6. Secondary a-c systems supplying interior wiring are required to be grounded if by so doing the voltage to ground does not exceed:
   (a.) 300 volts.
   (b.) 250 volts.
   (c.) 150 volts.
   Which is correct: a? b? c?

7. It is recommended by the Code that ac systems be grounded if by so doing the maximum potential to ground does not exceed:
   (a.) 300 volts.
   (b.) 150 volts.
   (c.) 50 volts.
   Which is correct: a? b? c?

8. By the term "isolation" as a substitute for equipment grounding in certain permissible instances is meant:
   (a.) the secondary of an isolating transformer.
   (b.) not readily accessible to persons unless special means for access are used.
   (c.) separated from ground by insulated supports.
   Which is correct: a? b? c?

9. Electric crane circuits operating over combustible fibers in a Class III location:
   (a.) are required to be grounded.
   (b.) are permitted to be grounded.
   (c.) are forbidden to be grounded.
   Which is correct: a? b? c?

10. Circuits of less than 50 volts are required to be grounded if:
   (a.) run overhead outside of buildings.
   (b.) run overhead inside of buildings.
   (c.) run underground.
   Which is correct: a? b? c?

Correct answers will be found on page 111.

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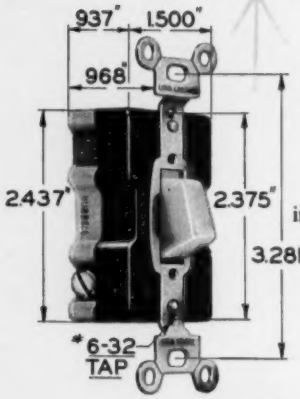

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buildings, etc.

In addition to the greater safety, system grounding provides, also, a more reliable installation from the standpoint of service by reducing maintenance costs and out-of-service down-time, since the process of locating faults on ungrounded systems is quite time-consuming, and since a simple initial fault often results in multiple faults and motor burnouts on ungrounded systems.

Equipment grounding

Equipment grounding, as distinct from system grounding, consists of intentional connections between all non-current-carrying metal parts of equipment and ground. Section 2541 of the Code states, "Exposed conductive materials enclosing electric equipment, or forming a part of such equipment, are grounded for the purpose of preventing a potential above ground on the equipment." Section 2531 says exactly the same thing about metal raceways.

In addition to maintaining such equipment at or near ground potential to prevent shock to personnel standing on the ground or on a grounded surface while touching such equipment at the time of a ground fault or short-circuit or other abnormal condition, proper equipment grounding provides, also, another very important function. It provides a low-impedance return circuit for ground-fault currents.

This low-impedance path is required by section 2551 which states, "The path to ground for circuits, equipment, or conductor enclosures shall be permanent and continuous and shall have ample carrying-capacity to conduct safely any currents liable to be imposed on it, and shall have impedance sufficiently low to limit the potential above ground, and to facilitate the operation of the overcurrent devices in the circuit."

Fault current flowing through high - impedance equipment grounding paths could cause dangerously high potentials across the different components of the grounding equipment. This would result, also, in arcing which, of course, could ignite dusts, gases, fibers, or other combustible materials. Yet, with such high-impedance, the current, though of sufficient intensity to ignite combustibles, may not be great enough to operate the overcurrent devices in the circuit. The failure of such de-

vices to operate and clear the fault would prolong the arcing and the high-potential shock hazards.

Correctly installed equipment grounding, by providing a low-impedance return path for fault currents, facilitates the operation of overcurrent devices and eliminates arcing and shock hazards.

So much for the *why* of grounding. In the interests of clarity, however, the other factors of grounding— the *what, when, where* and *how*—will be considered jointly or singly, whichever is most logical from time to time, rather than considering each one separately. It would be cumbersome, for instance, to list under *what* a 2-wire d-c system and then after several paragraphs return to the *when* (under what condition) and still later return again to this same item for explanations of the *where* and *how*.

The actual listings can be found in the Code itself. The purpose here is an endeavor to *understand* the Code. It is well to note, however, that the Code, itself, separates these factors broadly by the headings: *Systems and Circuits* (what and when); *Location of Grounding Connections* (where); *Conductor Enclosures* (what and when); *Equipment* (what and when); *Methods of Grounding* (how); etc.

Alternatives to grounding

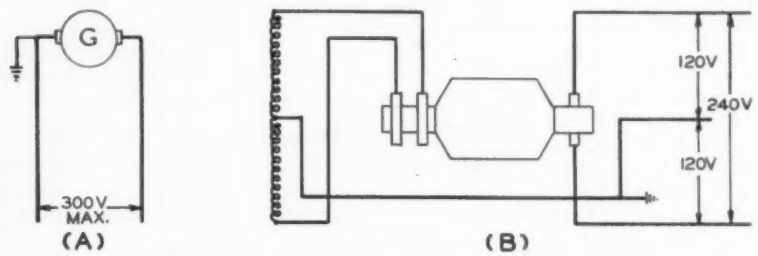
Section 2501 states in part, " . . . Insulation, isolation, and guarding are suitable alternatives (to grounding) under certain conditions." The question immediately arises: What are the "certain conditions" under which "insulation, isolation, and guarding" are to be considered as " suitable alternatives"?

The answer to this question is: Only under those conditions where specific reference is made to such alternatives by the Code itself. For instance, section 2443-f states that electric signs and associated equipment shall be grounded "unless these are inaccessible to authorized persons and are also insulated from ground and from other conductive objects". This reference to isolation and insulation is offered as an alternative to *equipment* grounding, not to circuit, or system, grounding.

Section 6503 permits insulation as an alternative to equipment grounding for an organ generator. Section 5135-f *requires* an insulated ungrounded circuit for hospital operating rooms instead of a grounded circuit. But the equipment grounding is also required in this case.

Neither isolation, insulation, or guarding, however, should be substituted for grounding unless such alternatives are specifically mentioned as suitable by the particular section of the Code which governs the equipment in question.

For system grounding, section 2512 requires all 2-wire d-c systems supplying interior wiring at potentials not greater than 300 volts between conductors to be grounded except limited-area industrial systems which are equipped with ground detectors. Section 2513 requires *all* 3-wire d-c systems supplying interior wiring to be grounded. Section 2522 requires all such grounded d-c systems, whether 2-wire or 3-wire, to be grounded only ". . . at one or more supply stations but *not at individual services nor elsewhere on interior wiring.*"



D-C SYSTEM GROUNDING—Two wire d-c systems such as shown at (A) are required to be grounded if maximum voltage is 300 volts or less, unless system is used for supplying industrial equipment in limited areas and a ground detector is applied. For voltages above 300 see fine print note of Section 2512. For three-wire d-c systems as shown in (B), supplying interior wiring, the neutral shall be grounded. The grounding shall be at supply stations only—not at individual services. See text for fuller explanation.

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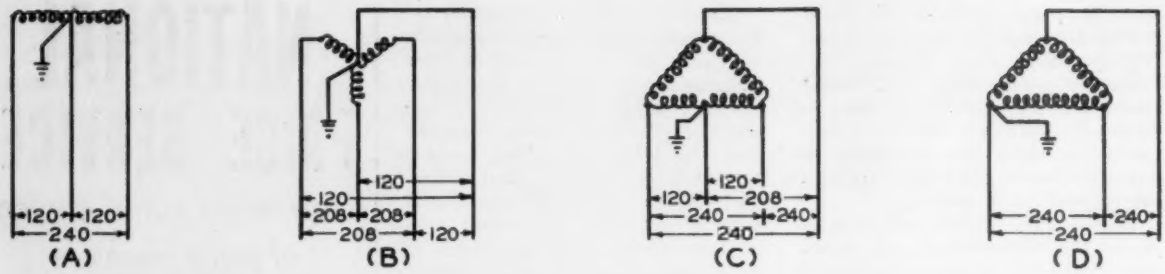

A-C SYSTEM GROUNDING—Four typical a-c systems are illustrated here. (A) Maximum volts to ground, 120; ground required. (B) Maximum volts to ground, 120; ground required. (C) Maximum volts to ground, 208; ground required if bare neutral is used (see Section 2303); 120 volt to ground system required to be grounded by all inspectors. (D) Maximum volts to ground, 240; grounding is not required.

A-c system grounding

Of more immediate interest to most of us are the requirements for a-c system grounding. Section 2514 requires "Secondary aternating current systems supplying interior wiring, and interior aternating current wiring systems" to be grounded if in so doing the maximum voltage to ground does not exceed 150 volts. (Note that any local system originating in, and confined to, a single interior is included in the same requirements as those governing the usual secondaries derived from primary distribution systems).

There are three exceptions to this requirement in section 2514 for grounding. These three exceptions are listed in sections 2515, 2516, and 2517 as follows:

(1) "Electric furnace circuits need not be grounded." (Section 2515) They *may* be grounded, but they are not required to be. The metal noncurrent-carrying parts, however, are required to be grounded (equipment grounding) if within reach of the ground or a grounded object or surface.

(2) Electric crane circuits (section 2516) operating over combustible fibers in a Class III hazardous location are *not permitted* to be grounded. This special case is covered more fully by section 5083 and will be discussed when we study Article 500 of the Code.

(3) "Circuits of less than 50 volts need not be grounded. . ." (Section 2517). Here, again, they *may* be grounded. However, there are three conditions under which circuits of 50 volts or less are *required* to be grounded as follows: (a) if the circuits are "supplied by transformers from systems of more than 150 volts to ground" on the primary of the 50-volt transformers, then the 50-volt circuits must be grounded unless an insulating transformer is used to supply 50 volts or less to portable tools in other than residential occupancies. (b) If the 50-volt circuits are supplied by transformers from an ungrounded system, they must be grounded. (c) If the 50-volt circuits are "run overhead outside of buildings" they must be grounded. The danger here would be from higher voltage conductors coming into physical contact with the 50-volt circuits.

A-c systems are *recommended* by the Code to be grounded if, by so doing, the potential to ground does not exceed 300 volts. If a bare or uninsulated conductor is used for the service entrance neutral, then a-c systems of this voltage are *required* to be grounded. It is *permissible* to ground systems with potentials exceeding 300 volts to ground. Some engineers are still not convinced of the desirability of grounding higher voltages, but the trend definitely is toward the increased practice of grounding at all voltages — a trend with which I am in complete accord. And, as stated above, the Code permits higher voltage groundings.

High-voltage circuits

If grounded, the higher voltages ranging between 2,200 and 15,000 should be grounded, as a rule through a resistance to limit high fault currents to safe values. System ground faults can be excessive and dangerous, especially with motor loads, and therefore should be limited. In this voltage range, sensitive relays for overcurrent protection are employed and will isolate the faulted circuit even when fault currents are intentionally limited.

Voltages above 15,000 volts are

(Continued on page 111)

More information on ground testing device:

SINCE our discussion in the September issue of a reader's inquiry about methods of testing grounding effectiveness, we have obtained important information about a newly developed instrument for making such tests. W. H. Farrington of Texas Electric Service Co., in Fort Worth, has developed, with the aid of his associates, an instrument for simplified ground testing.

This instrument, called the "Service Ground Test Set" has been manufactured to specification for the Texas Electric Service Company by the Eastern Specialty Company, Philadelphia 40, Pa. As described in the latter's bulletin No. 106, accurate ground testing can be accomplished in a matter of minutes by one man.

Potential metering transformers and the service voltage can also be checked by this instrument. It retails for $50; the carrying case for $7.50. Mr. Farrington writes, ". . . As you know, I am quite interested in promoting more adequate grounding . . . These instruments are performing very well and I do believe their use will help promote better grounding in any area where they are used . . ."

Questions on the Code

(Readers are invited to send in questions which they would like to see discussed in this department.

Spacing requirements for conduit supports

QUESTION: How far apart are conduit straps allowed to be placed by the Code? I know this is in the Code, but I couldn't find it.

ANSWER: The Code does not specify any definite spacings for conduit supporting straps. Section

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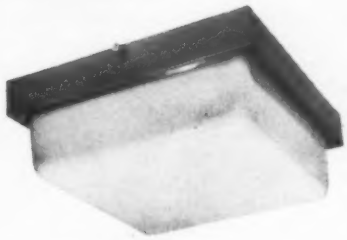

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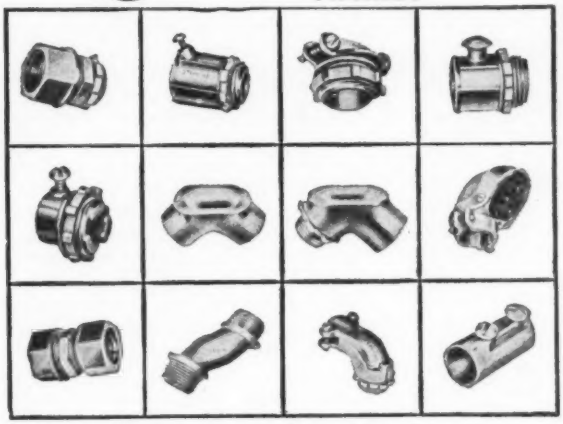

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3004 states, "Raceways, cable assemblies, boxes, cabinets and fittings shall, unless otherwise provided, be securely fastened in place . . ."

The Code does require specific distances for the supports for cables and various other wiring methods, but "proper" distances for rigid conduit and electrical metallic tubing supports vary with the size of the raceways, with the number of raceways in a group, and with the location of the raceways, such as whether they are to be strapped to a ceiling, along an exposed wall horizontally, resting on wall brackets, run vertically on an exposed wall, run within the hollow spaces of a wall, buried in a concrete floor, etc.

The stipulation in the section quoted above that such raceways be supported "unless otherwise provided" indicates that allowances are intended for temporary supports when raceways are enclosed in poured concrete decks, walls, and ceilings or when buried in the earth. Otherwise, supports are required as frequently as necessary to assure rigidity of the completed raceway.

Placing disconnect in sight of motors

QUESTION: I have heard it said that the practice of installing snap switches in series with the motor control circuit and in sight of motors to keep from placing the disconnect in sight of motor is really not Code. I have heard that this is handbook practice. Is it handbook practice or is it Code?

ANSWER: Section 4386 sets up a general rule as follows: "A motor and its driven machinery shall be within sight from the controller location . . ." This general rule is followed by four exceptions. Section 4409 sets up this general rule: "The disconnecting means shall be located in sight from the controller location . . ." This rule is followed by one exception. Both rules state, "A distance of more than 50 feet is considered equivalent to being out of sight."

Beginning with the disconnect first, the one exception permitted for this rule in section 4409 is that it be designed to lock in the open position. If it cannot be locked in the open position, the disconnect switch must be within sight of the controller.

The four exceptions permitted for the controller in section 4386 are: "(a) The controller or its disconnecting means is capable of being locked in the open position." So if either the controller or the disconnecting means can be locked in the open position, neither are required to be within sight of the motor.

"(b) A manually - operable switch, which will prevent the starting of the motor, is placed within sight from the motor location. This switch may be placed in the control circuit." There is your Code permission to use the method demonstrated by your handbook. This practice is permissible, then, by exception (b) of section 4386.

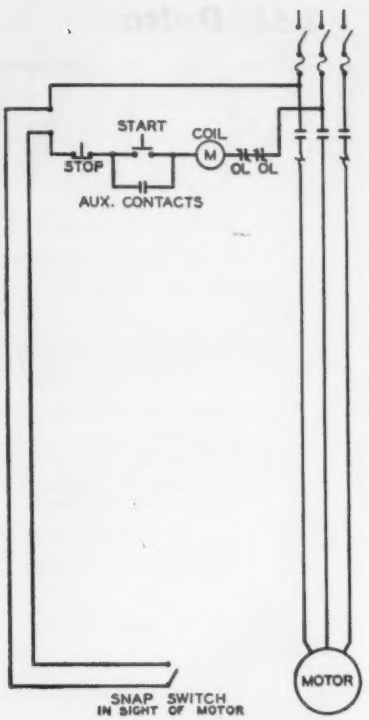
"(c) As otherwise specified in Article 500 of this Code." Section 5001 states, in a fine print note, "Through the exercise of ingenuity in the layout of electrical installations for hazardous locations, it is frequently possible to locate much of the equipment is less hazardous or in non-hazardous areas and thus to reduce the amount of special equipment required."

In the opinion of the Code-making authorities, therefore, a reduction in special equipment, and hence a reduction in cost, is justified by the placing of the disconnect and the controller in a remote location when the motor is in a hazardous location. Here again, however, most inspection authorities require the locked-type switch when placed outside of the hazardous area and hence out of sight.

The intent of the lock feature of this requirement is that it be so designed that a person working on the motor or its driven machinery can place his own personal pad lock on the switch or controller in such a manner that it can not be closed. A cabinet or panelboard lock with spare keys which may be in the possession of building owners or other persons is not acceptable. A hasp on a controller enclosure is acceptable only if a means of blocking open the contactors is provided.

The locked-type-switch exception has both good points and bad. The good points include locating the switch out of sight and out of reach of children, wineheads, pranksters, and the mildly curious when the motors are located in accessible locations, such as in public alleys, parks, and at public well sites.

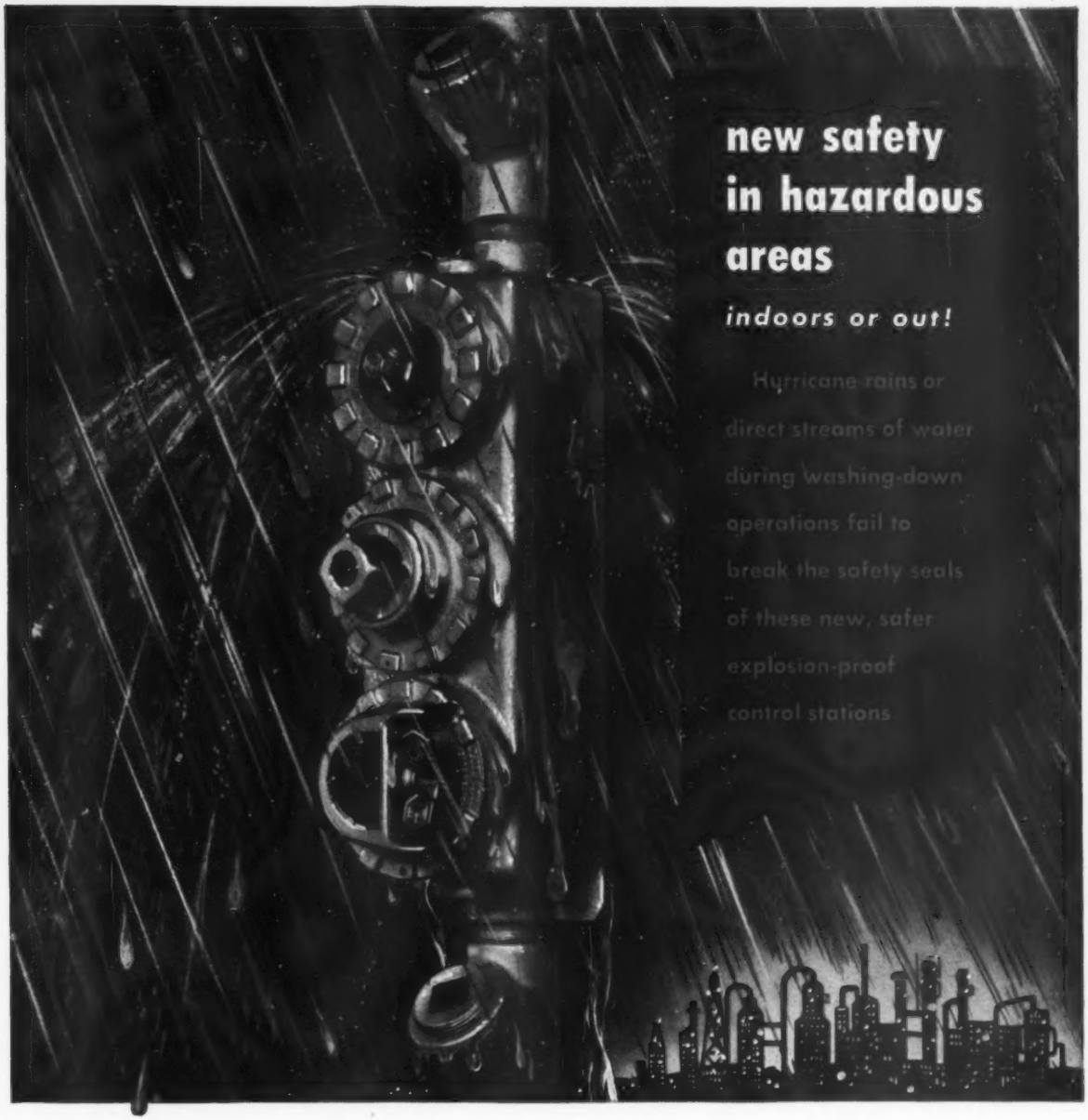
The bad point is simply this: Although the locked-type safety feature has been provided, will the man who works on the motor or its driven machinery actually use it? If it is in sight, he can see that no one turns on the current to electrocute or mangle him.



Snap switch in series with control circuit and within sight of motor is acceptable by the Code in case such as this where disconnect and controller are out of sight of motor or further than 50 feet, and where disconnect and controller are not designed to be locked in open position.

The switch in the control circuit has only bad points in so far as I can see. If this snap switch is open, no one can turn the current on by means of a push button—unless the snap switch wires become shorted. But the controller contactors can be manually closed by a person "testing" or curious. This may not be likely, but it is certainly possible; and most inspectors are opposed to the practice, although they are helpless to prevent it as long as the Code permits it.

Like any other rule, however, this one has its adherents. With the popularity of grouped switching units of panelboard design, there is a growing tendency to use only the snap switch at remote motor locations. Some even go further and object to this safety measure, contending that the momentary contact push button station is all that is needed. But, of course, a momentary contact switch alone is not permissible.



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Know the law

by Arthur L. H. Street

Contractor claims work stoppage loss

◆ DEFENDANT, the general contractor on a government aircraft base building job, awarded a subcontract for the electrical work to plaintiff. In settling with defendant, the Government allowed a work stoppage loss claim of $4695.10 on account of the electrical work. But plaintiff's actual loss was only $3620.32. On the facts involved, was the plaintiff electrical contractor entitled to collect from defendant the amount of its actual loss due to work stoppage?

Yes, declared the Louisiana Supreme Court in the case of Sonnier Electric Co. v. J. M. Brown Construction Co., 100 So. 2d 499. But because plaintiff's actual loss was only $3,620.32, the court said that defendant was not liable to plaintiff for more than that sum.

The general contract specifications contained the provision:

"Suspension of Work.—The contracting office (government representative) may order the contractor to suspend all or any part of the work for such period of time as may be determined by him to be necessary or desirable for the convenience of the Government. * * * In the case of suspension of all or any part of the work for an unreasonable length of time causing additional expense or loss, not due to the fault or negligence of the contractor, the contracting officer shall make an equitable adjustment in the contract price and modify the contract accordingly."

Form of subcontract

The electrical subcontract was in the form of a written purchase order signed by both parties. It referred to the aforementioned prime contract and particularly provided: "We accept your proposal for the electrical work on the above mentioned job according to plans and specifications, with attention to the General and Special Condition Sections of the specifications, as prepared by the Corps of Engineers."

Under the above quoted paragraph of the general contract and while construction was in progress, the Government suspended work. Some three and one-half months later the suspension was lifted and defendant was notified in writing to recommence construction. Defendant sent the notice to plaintiff, with a letter referring to the prime contract and stated that the district engineer's communication was self-explanatory.

Upon receipt of this letter plaintiff complained to defendant in writing about the additional expense to it caused by the stoppage. In a reply defendant specially mentioned the specifications in the prime contract, giving the contracting officer right to suspend work and thereafter to make an equitable adjustment in the contract price. Defendant warned that if plaintiff did not recommence work at once its bonding company would be notified.

As directed, plaintiff resumed the electrical work and completed it according to the sub-contract. Meanwhile, at defendant's request, it submitted a tentative estimate of its losses due to the stoppage, $500.98. Afterwards, one of defendant's partners met representatives of the Corps of Engineers in an effort to adjust the contract. Plaintiff's president attended one of these meetings. During the negotiations defendant submitted an electrical loss claim for plaintiff of $3620.32. Thereafter, plaintiff sent to the defendant an invoice for that amount.

As a result of negotiations the Government paid defendant $4695.10 on account of the work stoppage loss. But defendant offered plaintiff only $500.98. The offer was refused, and suit followed.

First, plaintiff sued for $3620.32, but later demanded $4695.10—the amount received by defendant from the Government for the electrical work losses. The theory of the suit was that the specifications under the prime contract were a part of plaintiff's sub-contract with the defendant, which recited that the electrical work should be performed according to the prime contract's plans and specifications; that the sub-contractor was bound by such suspension specifications; and that, therefore, plaintiff was entitled to whatever the Government allowed for stoppage losses in the electrical work.

Defendant, on the other hand, argued that it was under no obligation to pay anything to plaintiff for work stoppage, and that the only reason it tendered the $500.98 was that it "had agreed to pay same."

Sub-contractor's rights

The Supreme Court said that while it was true that there was no contract between plaintiff and the United States Corps of Engineers, such as would authorize a demand for damages by the former against the federal government, clearly specifications paragraph GC-11 under the prime contract were applicable as between plaintiff and defendant, for by reason thereof the sub-contractor was compelled to submit to any work suspension ordered by the government. This being so it was entitled to whatever the contractor collected as work stoppage losses under the electrical subcontract.

"But," the court continued, "plaintiff has not proved with legal certainty the additional loss of $1074.78 claimed by it on the electrical sub-contract. This is particularly true in view of the allegations of paragraph 11 of its original petition which are: 'That as hereinabove shown, said $4,695.10 paid as expense and loss by reason of suspension of electrical work represented $3,620.32 as expense and loss to petitioner, and $1,074.78 as expense and loss to J. M. Brown Construction Company.' "

Recent Kansas decision shows lien weaknesses

◆ EVERY electrical contractor should know what the law of his state requires in order to perfect and enforce a lien against a building and the land on which it stands. (For example, as related in a previous article, March 1958 issue, a lien in Arkansas was unenforceable because the notice to the debtor did not state the sum of money claimed to be due, did not show who owed the bill, and was sent by registered mail in-

(Continued on page 111)

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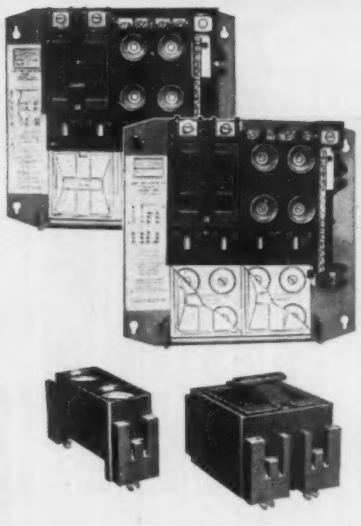

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New, revised estimating tables continued in this issue

A NEW SERIES of estimating tables, completely revised in the light of more recent jobs and experience, are presented in this issue and will appear from month to month in forthcoming issues. These electrical estimating data sheets cover labor only and are arranged alphabetically with the basic material headings as a title for each tabulation.

Labor units given in these tabulations are based on a minimum of interference during work progress. The averages listed do not provide for abnormal job conditions, and any such abnormal conditions will require adjustments by the user, based on his experience.

The work units covered by each table are composed of one or more separate but closely related operations necessary for the complete installation of a particular basic item of electrical equipment. These operations associated with the basic material are described at the bottom of each table.

Most of the electrical estimating tabulations follow the same form. Column 1 at the left shows the size of the material to be installed. The second column from the left gives the time required to install the material, and it should be noted especially that this "productivity" column may be based on individual units or in the case of cable or conduit on units of 100 feet or 1,000 feet. The abbreviations "Ea." for each, "C" for hundreds, and "M" for thousands in Column 2 indicate the basis of the labor hours.

Columns 3 to 13, from the left, give the actual labor costs in dollars per unit of installation, at various hourly wage rates.

When calculations are being made for an hourly wage rate that doesn't correspond to any of the rates listed in Columns 3 to 13, the user may multiply the number of hours in Column 2 by 100 and this will give the labor cost based on an hourly wage rate of $1 per hour. By multiplying this by the hourly wage rate that actually applies in the user's locality, the exact labor cost of the operation may be obtained. Labor costs obtained in this way will be for units, hundreds of feet, etc., as given in heading of Column 2 of the table.

The labor units covered by the tables represent direct job labor costs and do not include delivery of material to site, engineering, estimating, or any other indirect cost.

As will be noted, some of the electrical estimating tabulations to be given will be for independent operations, such as excavating, backfilling, etc. These are included for use in preparing estimates on work of a special nature not covered under a specific table heading.

Tables will appear in alphabetical order.

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PANEL SIZE	HOURS Ea.	LABOR COST INSTALLED EACH AT FOLLOWING RATES										
		$1.25	$1.50	$1.75	$2.00	$2.25	$2.50	$2.75	$3.00	$3.25	$3.50	$3.75
4	4.0	5.00	6.00	7.00	8.00	9.00	10.00	11.00	12.00	13.00	14.00	15.00
6	5.6	7.00	8.40	9.80	11.20	12.60	14.00	15.40	16.80	18.20	19.60	21.00
8	7.3	9.13	10.95	12.78	14.60	16.43	18.25	20.08	21.90	23.73	25.55	27.38
10	8.8	11.00	13.20	15.40	17.60	19.80	22.00	24.20	26.40	28.60	30.80	33.00
12	10.8	13.50	16.20	18.90	21.60	24.30	27.00	29.70	32.40	35.10	37.80	40.50
14	12.3	15.38	18.45	21.53	24.60	27.68	30.75	33.83	36.90	39.98	43.05	46.13
16	14.1	17.63	21.15	24.68	28.20	31.73	35.25	38.78	42.30	45.83	49.35	52.88
18	15.8	19.75	23.70	27.65	31.60	35.55	39.50	43.45	47.40	51.35	55.30	59.25
20	17.6	22.00	26.40	30.80	35.20	39.60	44.00	48.40	52.80	57.20	61.60	66.00
22	19.4	24.25	29.10	33.95	38.80	43.65	48.50	53.35	58.20	63.05	67.90	72.75
24	21.1	26.38	31.65	36.93	42.20	47.48	52.75	58.03	63.30	68.58	73.85	79.13
26	22.9	28.63	34.35	40.08	45.80	51.53	57.25	62.98	68.70	74.43	80.15	85.88
28	24.6	30.75	36.90	43.05	49.20	55.35	61.50	67.65	73.80	79.95	86.10	92.25
30	26.4	33.00	39.60	46.20	52.80	59.40	66.00	72.60	79.20	85.80	92.40	99.00
32	28.2	35.25	42.30	49.35	56.40	63.45	70.50	77.55	84.60	91.65	98.70	105.75
34	29.9	37.38	44.85	52.33	59.80	67.28	74.75	82.23	89.70	97.18	104.65	112.13
36	31.7	39.63	47.55	55.48	63.40	71.33	79.25	87.18	95.10	103.03	110.95	118.88
38	33.4	41.75	50.10	58.45	66.80	75.15	83.50	91.85	100.20	108.55	116.90	125.25
40	35.2	44.00	52.80	61.60	70.40	79.20	88.00	96.80	105.60	114.40	123.20	132.00

E-101-B

LABOR: INCLUDES DISSASSEMBLY OF PANEL, DRILLING ANCHOR HOLES, SITTING ANCHOR'S OR SCREWS INSTALLING CABINET, MAKING ALL BRANCH CONNECTIONS, BALANCING LOAD AND REASSEMBLY OF PARTS AND CABINET.

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NEW WORK

PANEL'S MULTIBREAKER DISTRIBUTION
4 WIRE - 3 PHASE SURFACE MOUNTED

PANEL SIZE	HOURS EA.	LABOR COST INSTALLED EACH AT FOLLOWING RATES										
		$1.25	$1.50	$1.75	$2.00	$2.25	$2.50	$2.75	$3.00	$3.25	$3.50	$3.75
6	5.2	6.50	7.80	9.10	10.40	11.70	13.00	14.30	15.60	16.90	18.20	19.50
8	6.7	8.38	10.05	11.73	13.40	15.08	16.75	18.43	20.10	21.78	23.45	25.13
10	8.0	10.00	12.00	14.00	16.00	18.00	20.00	22.00	24.00	26.00	28.00	30.00
12	10.0	12.50	15.00	17.50	20.00	22.50	25.00	27.50	30.00	32.50	35.00	37.50
14	11.4	14.25	17.10	19.95	22.80	25.65	28.50	31.35	34.20	37.05	39.90	42.75
16	13.1	16.38	19.65	22.93	26.20	29.48	32.75	36.03	39.30	42.58	45.85	49.13
18	14.7	18.38	22.05	25.73	29.40	33.08	36.75	40.43	44.10	47.78	51.45	55.13
20	16.1	20.13	24.15	28.18	32.20	36.23	40.25	44.28	48.30	52.33	56.35	60.38
22	18.2	22.75	27.30	31.85	36.40	40.95	45.50	50.05	54.60	59.15	63.70	68.25
24	19.8	24.75	29.70	34.65	39.60	44.55	49.50	54.45	59.40	64.35	69.30	74.25
26	21.6	27.00	32.40	37.80	43.20	48.60	54.00	59.40	64.80	70.20	75.60	81.00
28	23.4	29.25	35.10	40.95	46.80	52.65	58.50	64.35	70.20	76.05	81.90	87.75
30	25.1	31.38	37.65	43.93	50.20	56.48	62.75	69.03	75.30	81.58	87.85	94.13
32	27.0	33.75	40.50	47.25	54.00	60.75	67.50	74.25	81.00	87.75	94.50	101.25
34	28.5	35.63	42.75	49.88	57.00	64.13	71.25	78.38	85.50	92.63	99.75	106.88
36	30.5	38.13	45.75	53.38	61.00	68.63	76.25	83.88	91.50	99.13	106.75	114.38
38	32.2	40.25	48.30	56.35	64.40	72.45	80.50	88.55	96.60	104.65	112.70	120.75
40	34.1	42.63	51.15	59.68	68.20	76.73	85.25	93.78	102.30	110.83	119.35	127.88
42	36.2	45.25	54.30	63.35	72.40	81.45	90.50	99.55	108.60	117.65	126.70	135.75

E-101-B

LABOR: INCLUDES DISSASSEMBLY OF PANEL, DRILLING ANCHOR HOLES, SETTING ANCHOR'S OR SCREWS, INSTALLING CABINET, MAKING ALL BRANCH CONNECTIONS, BALANCING LOAD AND REASSEMBLY OF PARTS AND CABINET.

1-59

REWORK JOBS

PANELS MULTIBREAKER DISTRIBUTION
4 WIRE - 3 PHASE SURFACE MOUNTED

PANEL SIZE	HOURS EA.	LABOR COST INSTALLED EACH AT FOLLOWING RATES										
		$1.25	$1.50	$1.75	$2.00	$2.25	$2.50	$2.75	$3.00	$3.25	$3.50	$3.75
6	5.8	7.25	8.70	10.15	11.60	13.05	14.50	15.95	17.40	18.85	20.30	21.75
8	7.7	9.63	11.55	13.48	15.40	17.33	19.25	21.18	23.10	25.03	26.95	28.88
10	9.2	11.50	13.80	16.10	18.40	20.70	23.00	25.30	27.60	29.90	32.20	34.50
12	11.4	14.25	17.10	19.95	22.80	25.65	28.50	31.35	34.20	37.05	39.90	42.75
14	13.1	16.38	19.65	22.93	26.20	29.48	32.75	36.03	39.30	42.58	45.85	49.13
16	15.0	18.75	22.50	26.25	30.00	33.75	37.50	41.25	45.00	48.75	52.50	56.25
18	16.9	21.13	25.35	29.58	33.80	38.03	42.25	46.48	50.70	54.93	59.15	63.38
20	18.4	23.00	27.60	32.20	36.80	41.40	46.00	50.60	55.20	59.80	64.40	69.00
22	21.0	26.25	31.50	36.75	42.00	47.25	52.50	57.75	63.00	68.25	73.50	78.75
24	22.7	28.38	34.05	39.73	45.40	51.08	56.75	62.43	68.10	73.78	79.45	85.13
26	24.8	31.00	37.20	43.40	49.60	55.80	62.00	68.20	74.40	80.60	86.80	93.00
28	26.7	33.38	40.05	46.73	53.40	60.08	66.75	73.43	80.10	86.78	93.45	100.13
30	28.8	36.00	43.20	50.40	57.60	64.80	72.00	79.20	86.40	93.60	100.80	108.00
32	30.9	38.63	46.35	54.08	61.80	69.53	77.25	84.98	92.70	100.43	108.15	115.88
34	32.7	40.88	49.05	57.23	65.40	73.58	81.75	89.93	98.10	106.28	114.45	122.63
36	35.0	43.75	52.50	61.25	70.00	78.75	87.50	96.25	105.00	113.75	122.50	131.25
38	37.0	46.25	55.50	64.75	74.00	83.25	92.50	101.75	111.00	120.25	129.50	138.75
40	39.2	49.00	58.80	68.60	78.40	88.20	98.00	107.80	117.60	127.40	137.20	147.00
42	41.5	51.88	62.25	72.63	83.00	93.38	103.75	114.13	124.50	134.88	145.25	155.63

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1-59

Electrical Estimating—III

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News of the industry

edited for Southern readers

New showroom in Dallas opened by Lightolier

LIGHTOLIER, INC., recently opened a new showroom in Dallas, Texas. It is located at 1718 Hi-Line Dr., in the Trinity Industrial District. Harold Baldauf, southwestern regional manager for Lightolier, Inc., will head up the new lighting center.

To introduce the new facilities to Dallas, a series of private openings were held for architects, decorators, and the trade. The public was invited for a one-day Open House Preview. The consumer now is required to be accompanied by or referred by an architect, decorator, or trade source.

To display the diversified collections of Lightolier fixtures and lamps, designer Neil Oppenheim has made skillful use of methods and materials. The floors, for example, create a visual separation between collections that serve different purposes. In the entrance, where important decorative fixtures are displayed, the floors are gleaming gold vinyl-tile. The second area, where residential lamps and fixtures are shown, takes on a softer look with floors covered in beige carpeting. Centrally located is an outdoor garden area, with gravelled floor and redwood plank walls, to show Lightolier's outdoor lighting units. Beyond the garden is the architectural lighting section, where floors are gray vinyl-tile.

Of special interest to architects and interior designers is the news that the showroom's architectural lighting area is uniquely equipped with actual models of the most popular suspended ceiling systems, demonstrating their coordination with lighting fixtures.

In the building's 10,000 square foot interior, there are 6,000 square feet of showroom display space, as well as office, warehouse, and factory facilities.

Part of the 6,000 square feet of showroom display space in Lightolier's new lighting center in Dallas for the use of the electrical trade. The center is located in the Trinity Industrial District of Dallas.

Singleton re-elected president of NEMA

J. L. SINGLETON, Milwaukee, Wis., vice-president, Industries Group, Allis-Chalmers Manufacturing Co., was re-elected president of the National Electrical Manufacturers Association for the ensuing year at the 32nd annual convention of the organization. J. R. MacDonald, chairman of the board and president of General Cable Corp., was re-elected treasurer. Re-elected vice-presidents were A. D. R. Fraser, president of Rome Cable Corp.; N. J. MacDonald, president of Thomas and Betts Co.; and Frank H. Roby, executive vice-president of Federal Pacific Electric Co. Chris J. Witting, vice-president of Westinghouse Electric Corp., and W. R. Persons, president of Emerson Electric Manufacturing Co. are newly elected vice-presidents of NEMA.

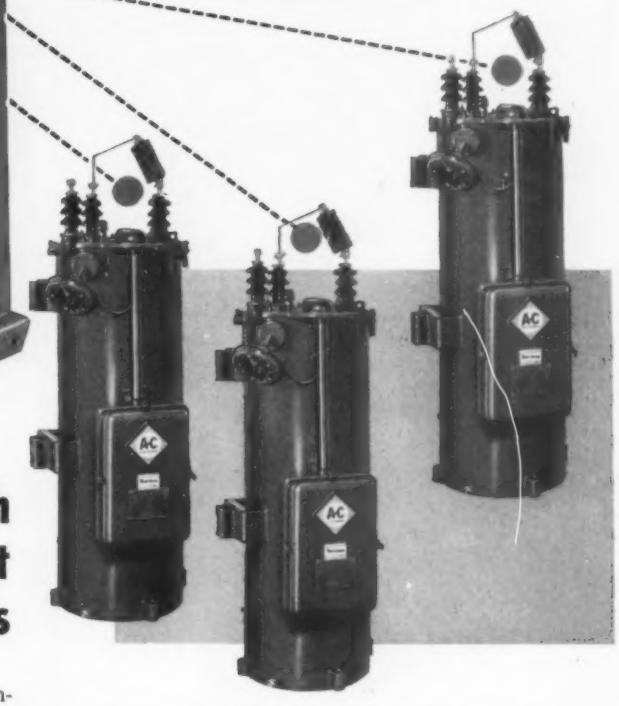
New company has offices in Miami and Clearwater

GEORGE H. FAY and L. W. Shaw announce the formation of Fay-Shaw & Co., Inc., manufacturers' representatives in the state of Florida. Both men have had years of experience in the electrical industry as manufacturers' agents and sales executives, and have wide acquaintance with contractors, architects, and engineers in addition to a large following among the Florida distributors. The company will maintain a sales office in Miami located at 832 South Miami Ave., and in Clearwater, P. O. Box 273. The principals feel that better representation can be made and better service given distributors

ALLIS-CHALMERS — 25 years of leadership in 5/8% regulators

Plan to stay ahead... MODERNIZE!

Save 30%...



Now— save 30% with one 3-phase unit or 3 single-phase units

The low-cost 3-phase distribution regulator is another Allis-Chalmers first in regulator development released in our 25th Anniversary year. It features these exclusive advantages:

1. **30% less cost for 3-phase regulation.**
2. **20% less weight for easier handling, faster installation.**
3. **33% less installation space.**
4. **160% *Vari-Amp* rating to 600-ampere maximum.**

Available ratings include: 500 and 750 kva, 8660 volts, and 500, 750 and 1000 kva, 13,200 volts — these regulators also available in forced-air ratings.

Mechanical features include the outstanding "Quick-Break" tap-changing mechanism, *Feather-Touch* control; unidirectional breather; and *Vari-Amp* rating.

This development completely changes the economics of 3-phase regulation. Savings are important enough to warrant re-evaluation of present substation commitments.

Get details from your nearby A-C office, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

Originators of 5/8% Step Regulators

A-5857

ALLIS-CHALMERS

Feather-Touch and Vari-Amp are Allis-Chalmers trademarks.

through unified efforts with sales offices in two strategic marketing areas. Plans are under way to create an adequate organization to give distributors and their salesmen the greatest possible assistance.

One-man campaign downs pole signs in Virginia

AFTER 20 YEARS of fighting all types of signs on utility poles, Charles H. Russell, Arlington, Va., is finally seeing the results of his one-man campaign. As a manufacturers representative for a number of firms who sell safety equipment to the utility companies and contractors, Mr. Russell is well acquainted with the problem pole signs have created. Now he can proudly claim, "There's not a political poster on a utility pole anywhere in Northern Virginia."

Many restrictions on signs previously had been in effect in Arlington County, but civic and political figures attribute the complete disappearance of the pole signs to the efforts of Mr. Russell. Last year he sent a letter to all candidates in his district asking them not to put up signs on poles. He then obtained help from the State Highway Department. Department officials took down the signs on state right-of-way because they violated the state code.

Largely because of Mr. Russell's efforts, Arlington County has now revised its ordinances to require that permission from the owner and the utility company be obtained before a sign can go up. Naturally, the utility companies are saying, no.

The reasons Mr. Russell lists for opposing signs on utility poles are: they cause confusion on the part of motorists; nails, tacks, and splinters are a hazard to utility linemen; and old posters are a blow to civic pride.

Foreign generators ordered for TVA

THE SPENDING of more than $2,500,000 for the purchase of three generators from a foreign company by the Tennessee Valley Authority was severely criticized by officials of Allis-Chalmers Manufacturing Company, which quoted the lowest bid of American firms.

The Authority recently announced the results of bids received for three 60,000 kilowatt generators to be installed in Wilson Dam near Sheffield, Alabama. There are three foreign bids and three American bids. Tennessee Valley Authority's engineers have approved one of the foreign bids which is 38% below the lowest American bid, and the purchasing department of the Authority has recommended that the Board accept it.

At a hearing with the TVA Board, J. L. Singleton, vice-president of Allis-Chalmers, said emphatically that he was there to plead a cause and the principle concerning the increasing problem of heavy power equipment imports.

Mr. Singleton told the board of directors of TVA that: "The only reason our government can set tax rates so high is due to the high level economy which we have developed in this country. Your purchasing this large quantity of heavy electrical apparatus abroad is ignoring your responsibility to play fair by spending money our government collects in the same kind of an economy from which it gets it."

Mr. Singleton went on to explain that labor rates in American plants are from two to three times as high as those of the foreign bidders.

In response to press inquiries following the meeting with Allis-Chalmers officials, the TVA Board of Directors said: "Economy and efficiency are of primary importance in all of TVA's operations. Foreign bids are considered and purchases made when they would contribute to economical operation. Such purchases are in conformance with the national policy of the United States with respect to international trade."

CIL COURSE—To qualify as Certified Inspiration Lighting Specialists, members of the Noland Co., Atlanta, received a Moe Light CIL course recently. Bill Rorabaugh, Noland assistant general manager, conducted the instruction on the extensive residential lighting program developed by Thomas Industries, Inc., Louisville, Ky. CIL specialists are being trained under this program throughout the Southeast.

Addition to NAED staff announced recently

THE NATIONAL Association of Electrical Distributors has announced that Lowell D. Crandon, Jr., has joined the association's staff at its headquarters office in New York. Mr. Crandon will assume the duties of field representative for NAED.

Mr. Crandon was formerly associated with the New Jersey Power and Light Co. and the Jersey Central Power and Light Co., subsidiaries of the General Public Utilities Corp. of N. Y. C. During the eight years he spent with these utilities he was responsible for the administration of sales and public relations on a division level.

In that capacity he worked closely with the allied electrical trade, including manufacturers' representatives and agents, electrical distributors, application engineers, trade associations, civic and business service organizations, retailers, and consumers. In addition, Mr. Crandon negotiated power line extensions and related work.

Johns-Manville opens seventh new plant

JOHNS-MANVILLE put its seventh new factory this year into production recently.

It is one of eight new plants in the company's current expansion program scheduled to be in operation during 1958, the company's 100th anniversary year. The new plant, located in south Chicago, is operated by the Johns-Manville Dutch Brand Division.

The new plant increases by more

than 50 per cent the J-M Dutch Brand Division capacity for production of pressure-sensitive tapes, adhesives, and related rubber products.

A. R. Fisher, chairman and president of Johns-Manville and E. F. Boyle, vice-president and general manager of the J-M Dutch Brand Division, other Johns-Manville officials, about 100 members of the press, and city officials, attended the plant opening and a luncheon that followed.

Mr. Fisher pointed out that the construction of the new, multi-million dollar Chicago plant is evidence of the optimism with which Johns-Manville regards the near and long-term future of the United States and the Great Lakes area.

Pointing out that construction is one of the nation's principal economic props, he said he believed that in 1959 new construction will pass the $50 billion mark for the first time in history, depending to some extent on the availability of mortgage money for housing.

"There may be temporary setbacks, of course," he said, "but for the long term we should have a bigger boom than the record-breaking period that followed World War II."

It was noted that new Johns-Manville factories being put into production this year are all strategically located for participation in the coming industrial and construction boom which most economists confidently expect to be underway in the early 1960's, or sooner.

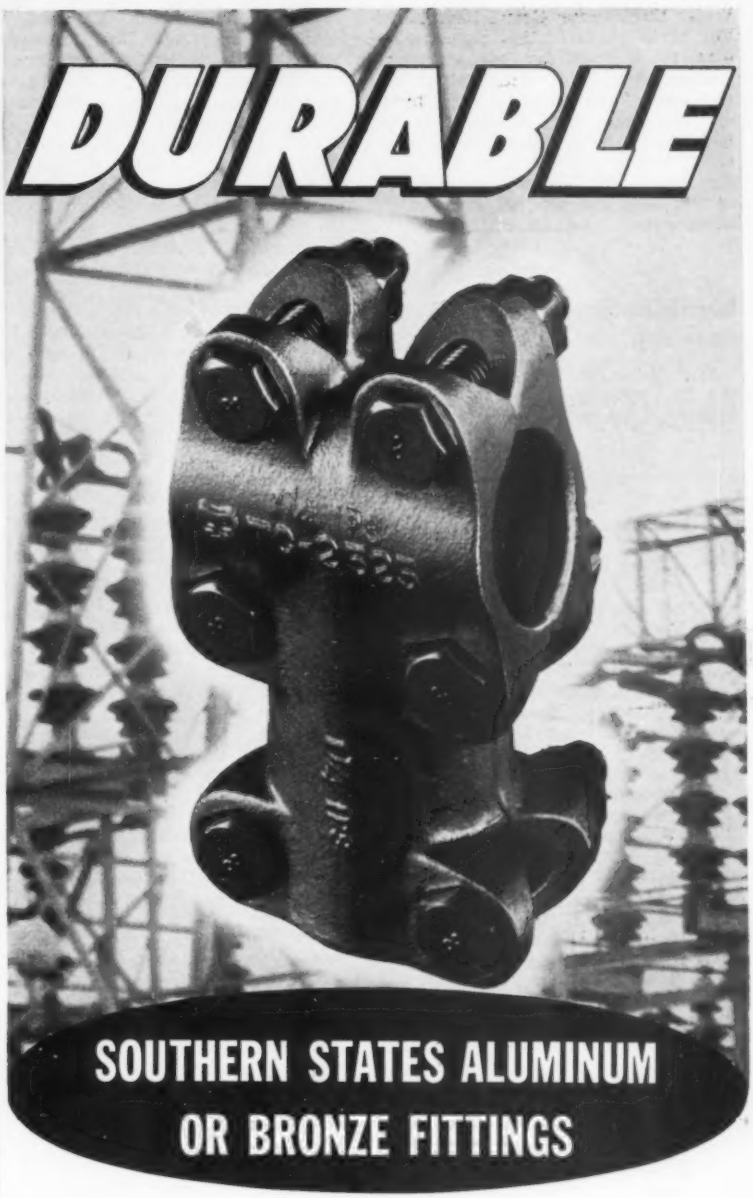
New engineering V.P. for A. B. Chance Co.

CLARENCE H. LEVEE has been appointed vice-president of engineering of the A. B. Chance Co., Centralia, Mo. In his new position, LeVee will

Clarence H. LeVee

be in charge of all product engineering research, development, and design.

For the past two years he has been director of engineering and research for another electrical equipment manufacturer. Previous to that he was power consultant for J. G.



Knowing that fittings are often re-used, Southern States has designed its entire line with easy, on-the-job assembly and re-assembly foremost in mind. Southern States connectors and bus supports have recessed hexagonal bolts, assuring easy and rapid "one-wrench" installation or removal. Each connector fits properly, has ample strength, and is sufficiently rugged at stress points. *Never underestimate the importance of a good connection!*

SOUTHERN STATES
EQUIPMENT CORP.
HAMPTON, GEORGIA

IN CANADA: Dominion Cutout Co., Ltd., Toronto

White Engineering Corp., New York. For three years in this capacity he was responsible for all electrical transmission and distribution installations, both civilian and military, on Formosa. His previous background includes experience in the fields of utility operations and construction, consulting engineering, utility sales, and product engineering development and administration.

Manufacturers appoint new representatives

ROBERT W. FISHBURNE, 1725 Arlington Rd., Richmond 20, Va., has been appointed sales representative in Virginia and North Carolina for Spang Underfloor Duct, manufactured by the Spang-Chalfant Division of The National Supply Co. He will continue to serve as representative for Spang Conduit.

Edgar E. Dawes and Co., 405 Rhodes Bldg., Atlanta 3, Ga., has been appointed to handle Spang Underfloor Duct in South Carolina, in addition to the company's original territory of Florida, Georgia, Alabama, and eastern Tennessee.

* * *

THE PAINE CO., 501 Westgate Rd., Addison, Ill., has added four new southern electrical sales representatives for 1959. The announcement came from C. C. Coffey, vice-president and regional sales manager located in Paine's Dallas, Texas offices.

The new Paine representatives located in key marketing areas are: Bill Crichton and Associates, Riverview, Fla.; Berry-Elsberry, Atlanta, Ga.; Galvin Sales Agency, Houston and Dallas, Texas; and W. W. Hasbrouck, Charlotte, N. C.

* * *

FREDERICK J. BEX of Atlanta, Ga., has been named southeastern sales representative of the Bermico Division of Brown Co., Berlin, N. H. Bex will handle sales of Bermico electrical conduit, fibre pipe for sewers and sewage disposal fields, for land and highway drainage, irrigation, etc.

* * *

EXPANSION of their marketing facilities into the central and northern Texas area has been announced by Hill Transformer Co., San Carlos, Calif. The Hill line of dry, askarel, and oil-filled transformers will be available in this area through Burrus and Matthews Co., 2810 Canton St., Dallas, Texas.

* * *

J. E. WATSON, JR., former manager of the Miami district of Allis-Chalmers Industries Group, has been

J. E. Watson, Jr.

W. E. Scott

appointed manager of the firm's New Orleans district.

Watson succeeds R. F. Muller, who retired October 1 after 38 years of

Dates Ahead

American Institute of Electrical Engineers, Winter General Meeting, Statler Hotel, New York, N. Y., Feb. 1-6, 1959.

Edison Electric Institute, Transmission and Distribution Committee Meeting, Morrison Hotel, Chicago, Ill., Feb. 12-13, 1959.

Southeastern Electric Exchange, Annual Conference, Boca Raton Hotel & Club, Boca Ratin, Fla., March 23-25, 1959.

Oklahoma Utilities Association, Annual Convention, Mayo Hotel, Tulsa, Okla., March 26-27, 1959.

American Institute of Electrical Engineers, Conference on Electrical Applications in the Textile Industry, Heart-of-Atlanta Motel, Atlanta, Ga., April 2-3, 1959.

Edison Electric Institute, 27th Annual Convention, New Orleans, La., April 6-8, 1959.

American Institute of Electrical Engineers, South East-South Central District Meeting, Dinkler Plaza Hotel, Atlanta, Ga., April 8-10, 1959.

Conference for Protective Relay Engineers, A & M College of Texas, College Station, Texas, April 13-15, 1959.

National Electrical Contractors Association, Southwest District Joint Meeting with IBEW, San Antonio, Texas, April 13-16, 1959.

Missouri Valley Electric Association, Engineering Conference, President Hotel & Municipal Auditorium, Kansas City, Mo., April 15-17, 1959.

Southeastern Electric Exchange, Engineering and Operation Section Meeting, Belleview Biltmore Hotel, Belleair, Fla., April 16-17, 1959.

Edison Electric Institute, Meter and Service Committee Meeting, Chase Hotel, St. Louis, Mo., April 27-29, 1959.

Edison Electric Institute, Transmission and Distribution Committee Meeting, The Shoreham, Washington, D. C., May 7-8, 1959.

American Institute of Electrical Engineers, Middle Eastern District Meeting, Lord Baltimore Hotel, Baltimore, Md., May 19-21, 1959.

American Institute of Electrical Engineers, Summer and Pacific General Meeting, Seattle, Wash., June 22-26, 1959.

Edison Electric Institute, Meter and Service Committee Meeting, Wentworth - by - the - Sea, Portsmouth, N. H., Sept. 14-16, 1959.

Public Utilities Association of the Virginias, Annual Meeting, The Greenbrier, White Sulphur Springs, W. Va., Sept. 17-20, 1959.

Edison Electric Institute, Transmission and Distribution Committee Meeting, Rice Hotel, Houston, Texas, Oct. 1-2, 1959.

American Institute of Electrical Engineers, Fall General Meeting, Chicago, Ill., Oct. 12-16, 1959.

association with the New Orleans district. Watson came to Allis-Chalmers in 1949 and was a representative in the Birmingham office before being transferred to Miami in 1951. He is an electrical engineering graduate of Duke University and a member of the American Institute of Electrical Engineers.

W. E. Scott, sales representative in the Charlotte district since 1952, becomes manager of the Miami district. Scott joined Allis-Chalmers in 1950 and is a mechanical engineering graduate of Duke University.

Men moving up in the industry

GEORGE J. TAYLOR, vice-president in charge of eastern operations for Day-Brite Lighting, Inc., St. Louis, Mo., announces the appointment of George J. Kennedy as general sales manager —eastern region. In his new position, Kennedy will have managerial responsibility over 10 sales territories in the Northeastern area of the United States. His headquarters will be in New York City.

* * *

C. GREGG GEIGER has been promoted to the position of General Sales Manager, Johns-Manville Dutch Brand Division. Announcement of the appointment was made by E. F. Boyle, vice-president and general manager of the Chicago industrial tape manufacturer.

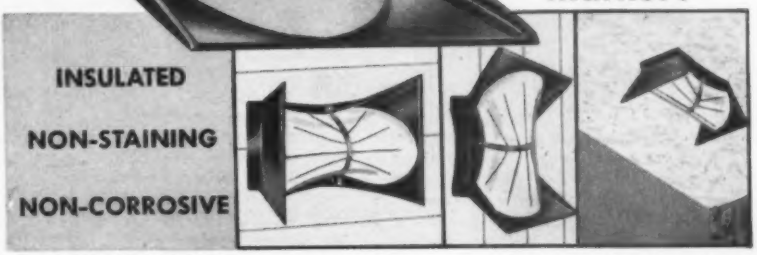
C. Gregg Geiger

Geiger began his career with Johns-Manville in 1947 as a market analyst in the Dutch Brand Division at Chicago, and was named merchandise manager of the division in July, 1950. He will maintain offices at the Dutch Brand Division headquarters, 7800 South Woodlawn Ave., Chicago.

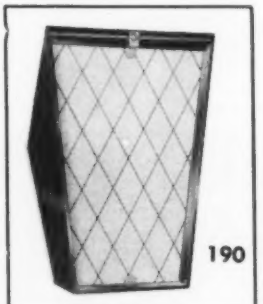
* * *

BERNARD J. DORSEY, Norfolk, Va., has been elected vice-president for the Northern Division of Virginia Electric and Power Co. He will succeed John W. Howard, who retired recently. Dorsey will move to Alexandria, VEPCO's Northern Division

UNION'S
Non-Metallic
3-WAY MOUNTING
LIGHTING
FIXTURE
for Today's
STYLE-WISE
PRICE-WISE
market!



3-WAY MOUNTING —Horizontally —Vertically —On the ceiling



No. 192—A wasp-waist fixture designed to compliment the styling of modern construction. The symmetrical design of this fixture makes it equally attractive when mounted vertically, horizontally or on the ceiling.

No. 190—A traditional bracket lantern in a refreshingly new style. The grid design on the frosted globe accentuates the glossy black finish of the one piece molded fixture.

POST LANTERNS too . . .

No. 200—A smart blend of old and new designs. The frosted "prismatic" globe provides a soft, diffused light. The threaded globe and base plus a gasket protect the lamp holder from bugs, dust and moisture. Non-metallic base makes the fixture rust and corrosive proof.

U. L. Listed

UNION INSULATING CO.
Parkersburg, W. Va.

headquarters.

Dorsey was VEPCO's district manager in Norfolk. He has been with the company since 1927 and also has served as district manager at Arlington, Newport News, and Charlottesville.

Howard was elected Northern Division vice-president in 1946. He held a number of managerial positions with the Virginia Public Service Company between 1928 and 1946.

* * *

ARTHUR C. WESTROM has been appointed director of engineering, research and development of Hubbard and Company, Chicago, Ill. He re-

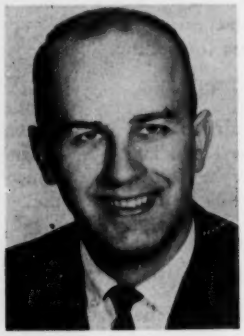
Arthur C. Westrom

places Clarence H. LeVee who has resigned.

Mr. Westrom has been with the Hubbard organization since 1950 as assistant director of research, also as director of research, electrical apparatus.

* * *

JOHN L. PALSHAW has been appointed advertising manager of the Edwards Company, Inc., one of the nation's oldest and largest manufac-



John L. Palshaw

turers of electrical signaling, communication and protection devices, it was announced recently by Robert L. Kempton, general sales manager.

In addition to directing advertising and public relations activities for the 86-year-old concern, Mr. Palshaw will continue as a member of the market planning committee.

LIGHTING DYNAMICS SALES MEETING—Southern representatives of Lighting Dynamics, Inc., attended the company's National Sales Meeting at the Whittier, Calif., home office. Representatives here are discussing the salability of a fluorescent fixture with Jim Bond, Lighting Dynamic's Director of sales. Left to right are Sude Sudekum, Dallas, Texas; Frank Donahue, Lubbock, Texas; Chic Young, Little Rock, Ark.; Jim Bond; Jim Ferguson, Houston, Texas; Tom Bullock, Louisville, Ky.; Bill Caswen, Lake Wales, Fla.; and Jim Knight, Dallas, Texas.

MATHIAS KLEIN & Sons, Chicago, manufacturer of electricians' tools and equipment, has recently added three new sales engineers.

Richard Colsant, based in Atlanta, Ga., will cover the Southeast; Stafford Gavin, based in Pittsburgh, Pa., will cover the East North Central states; and Ervin Suess, based in Kansas City, Kan., will cover the Middle West.

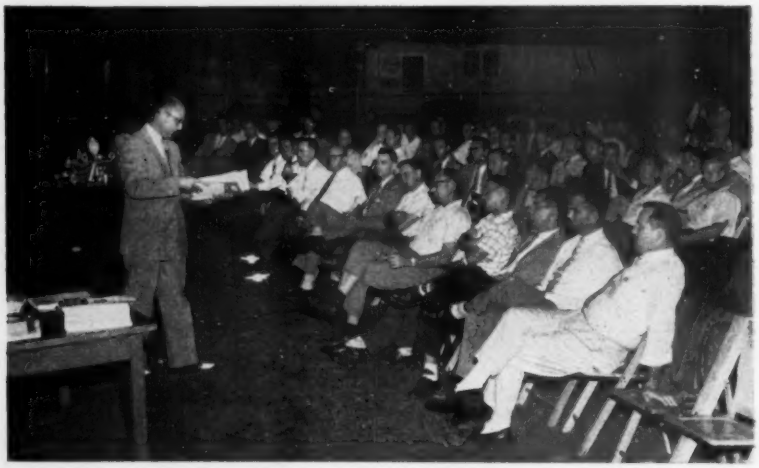
* * *

APPOINTMENT of Jack Grattan as manager of the Rawlplug Dallas Company has been announced by A. J. McEwan, vice-president.

FRANK G. MCNEAL has been appointed controller of the Bethea Co., Inc., Birmingham, Ala. Mr. McNeal comes to Bethea with wide experience in the accounting field. He fills a position made necessary by the continued growth of the company.

Brief news notes of manufacturers

MORE THAN 250 engineers and distributors' personnel—representing 40 companies in three southern states—



Howard W. Stentz, executive field engineer for the Wide-Lite Corp., of Houston, conducts product information meeting in New Orleans.

recently attended a product information meeting in New Orleans presented by the Wide-Lite Corporation of Houston.

Howard W. Stentz, executive field engineer for Wide-Lite, conducted the demonstration after Dallas Calmes, Wide-Lite's executive vice-president, opened the meeting.

The demonstration was sponsored jointly by Associated Manufacturers' Agents, Graybar Electric Co., and Interstate Electric Co., all of New Orleans.

Three representatives from Associated Manufacturers' Agents of New Orleans—Harry T. Bailey, Jr., Charles C. Kleinschmidt, and Russell Titherington—assisted Stentz in the presentation.

Some of the 40 large industrial companies represented at the meeting were New Orleans Public Service, Inc., Louisiana Power & Light Company, Central Louisiana Electric Company, Gulf States Utilities Company, Illinois Central Railroad, Shell Oil Company, Freeport Sulphur Company, and Kaiser Aluminum & Chemical Company.

* * *

ACQUISITION of the Benjamin Electric Manufacturing Co., Des Plaines, Ill., by Thomas Industries, Inc., of Louisville, Ky., has been announced jointly by Lee B. Thomas, chairman of the board of Thomas Industries, and John R. Bartizal, president and chairman of Benjamin Electric Manufacturing Co., subject to stockholder confirmation.

Thomas will purchase substantially all of the assets of Benjamin Electric for an undisclosed consideration consisting partly of preferred stock and partly of cash, and will assume substantially all liabilities of Benjamin Electric, Mr. Thomas said.

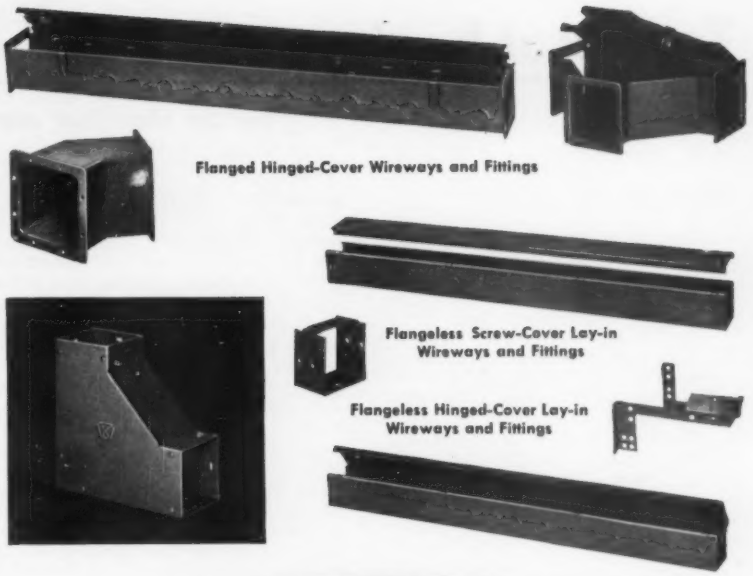
* * *

MALCOLM BETHEA, JR., President Bethea Co., Inc., Birmingham, Ala., has announced that Bethea has recently completed plant expansion which increases available floor space from 15,000 sq. ft. to over 20,000 sq. ft. Mr. Bethea says that this increase will provide space for additional machinery and also give additional storage area for finished products. The plant expansion is a part of an overall program which has doubled Bethea's capacity.

Construction of company's new plant announced

CONSTRUCTION of an additional manufacturing plant at its Elizabeth, N. J. site has been announced by the Thomas & Betts Co., manufacturers of electrical fittings and connectors.

The new building will have two stories and 92,000 sq. ft. of floor area. It will be the largest of T&B's buildings.


Flanged Hinged-Cover Wireways and Fittings
Flangeless Screw-Cover Lay-in Wireways and Fittings
Flangeless Hinged-Cover Lay-in Wireways and Fittings

It pays to figure on

KEYSTONE

wiring installation equipment

You name it—Keystone has it! Here's the most complete line of quality wiring installation equipment available — anywhere! All sizes, shapes and types of U.L. listed wireways and auxiliary fittings, cabinets, boxes and enclosures—all easy to install and maintain, too. What's more, when you're faced with a special job that "standards" just can't handle—then Keystone will quickly provide custom enclosures to meet your exact needs!

In addition, you'll save time when you specify Keystone — because coast-to-coast regional warehouses assure you of getting *what* you want, *when* and *where* you want it!

Type SC and FC Screw-Cover Pull Boxes

Type A Hinged-Cover Surface Cutout Boxes

Single and Double Door Current Transformer Cabinets

Type PF and PS Telephone Cabinets

3 NEW CATALOGS—Contain complete information on the entire Keystone quality line. Send for your free set today!

KEYSTONE MANUFACTURING COMPANY

23378 Sherwood Road • Warren, Michigan

Technical books

for the electrical man

Electronic Circuits

"Handbook of Electronic Circuits," Authored by RCA Service Co., Inc., Published by Howard W. Sams Co., Inc., 2201 E. 46th St., Inidanapolis 6, Ind., 76 pages, $2.00

This reference book is of real value and importance to service technicians, engineers, and students. Covered in this valuable handbook is vital information on: 4 power supply circuits; 14 circuits used in radio stages; 8 circuits used in transmitter stages; 32 stages used in TV receiver stages; 7 additional circuits having special application.

An analysis of the operation of each circuit is given; a schematic for each is included; a component failure analysis describes various troubles which could occur if particular components in the circuit should fail.

Distributed through Electronic Parts Distributors throughout the country," it carries the Howard W. Sams Catalog No. HEC-1.

Applied mathmatics

"Applied Mathmatics for Engineering and Physicists," (Revised Second Edition) by Louis A. Pipes. Published by McGraw-Hill Book Co., 330 W. 42nd St., New York 36, N. Y., 723 pages, $8.75.

This greatly revised second edition covers those subjects which are essential for the understanding of present-day engineering analysis: infinite series, complex numbers and the complex transform theory, vector and tensor analysis, partial differential equations, modern algebraic methods including matrices, integral equations, the calculus of variations, and ordinary nonlinear differential equations.

An unusually complete treatment of matrices—additional material on the inversion of large matrices has been included, and an entire section on matrix algebra has been rewritten to incorporate the many new techniques involving applications of matrices to problems in engineering and physics development in the past ten years.

New material has also been added on the computation of the eigenvalues of matrices and their applications to problems in dynamics.

The Laplace transform and its application receives a more thorough treatment than is usual in books of this kind. The chapter on the Laplace transform has been rewritten to clarify the various notations used by different authors and to include additional applications to integral equations and the summation of series.

An *entirely new* section on tensor analysis has been added to the chapter on vector analysis. The section dealing with the calculus of variations and its applications has been completely rewritten. The chapter on nonlinear oscillatory systems now includes modern developments in the techniques of solving nonlinear differential equations.

Transformers

Copies of the following transformer guides are available from the American Standards Association, 70 East 45th St., New York 17, N. Y.

These guides are appendices to American Standard Requirements, Terminology, and Test Code for Distribution, Power, and Regulating Transformers, and Reactors other than Current-Limiting Reactors (C57.12-1956). However, the guides are not to be considered a part of the American Standard.

"Guide for Installation and Maintenance of Dry-Type Transformers," $.50 each. The guide for dry-type transformers covers general recommendations for the operation and maintenance of distribution and power transformers in ratings above 50 kilovolt-amperes and above 600 volts, both for indoor ventilated types, cooled by natural draft or forced draft, as well as for sealed types.

"Guide for Installation and Maintenance of Oil-Immersed Transformers," $.75 each. The installation and maintenance guide for oil-immersed transformers is an editorial modification of the NEMA Guide for Instructions for the Care and Maintenance of Oil-Immersed Transformers, which was written for the use of electrical engineers, superintendents of distribution, line foremen, electricians, operators, students, and others responsible for the installation and maintenance of transformers.

The following three types of oil-immersed transformers are covered by the guide: (1) conventional pole-type distribution transformers, 3 to 167 kilovolt-amperes, inclusive, 125 kilovolts basic impulse insulation level and below, (2) protected pole-type distribution transformers, 3 to 167 kilovolt-amperes, inclusive, 125 kilovolts basic impulse insulation level and below, (3) station-type distribution and power transformers, 168 kilovolt-amperes and larger or 150 kilovolts basic impulse insulation level and higher.

Servicing hi-fi

"Servicing Hi-Fi and Associated Audio Equipment." Published by Howard W. Sams and Co., Inc., 2201 East 46th St., Indianapolis 6, Ind., 160 pages, $2.95.

Volumes one and two of this book have recently been placed on sale by Howard W. Sams and Co., Inc. Each volume contains a special, informative section on hi-fi techniques followed by selected service data on popular makes and models of custom hi-fi and audio equipment.

The first volume (catalog no. HF-1) contains coverage on 26 models of 1956-1958 equipment including power amplifiers, preamps, AM-FM receivers and tuners, and public address systems.

Volume two (catalog no. HF-2) contains the same type of coverage on 27 models of 1956-1958 equipment, plus a special section on the planning and installation of stereophonic home music systems. The index is cumulative for both volumes.

These volumes should be valuable to the technician who services audio equipment and to the audiophile and hobbyist who wants complete information on audio equipment.

Fundamentals in Electronics

"Experimental Basic Electronics." By Evans and Porter. Published by McKnight and McKnight Publishing Co., Bloomington, Ill., 104 pages, $3.00.

Experimental Basic Electronics was designed by its authors to give students basic experience in all the major uses of electronics: communication, control and protection, measurement, and conversion of electricity to other forms. Theory is introduced along with work experience gained in performing the 18 experiments. Each experiment includes a list of equipment, a schematic drawing and photograph of the layout of parts, a word description, and questions for study.

PUT FULL HOUSEPOWER TO WORK

No Venting To Get In The Way Of Sales

Dryer sales mean an average of 750 KWHR a year to you—and can boost a household's load factor an average of 4% a year. To stimulate sales of this revenue-building, profit-producing appliance, Hotpoint offers 100% Vent-Free Drying—a Hotpoint "first" designed to close the gap between dryer and washer sales.

Clothes are dried in a sealed chamber—lint and moisture are washed down the drain by a cold water spray. There is no venting, and no lost sales because of venting costs. Display and promote 100% Vent-Free Hotpoint dryers for greater earnings in 1959.

Model LC970

100% VENT-FREE

No need for costly, unsightly ductwork...your customers can save $15 to $30 on installation

All-New 3-Cycle Drying Adds Extra Salespower To Hotpoint Dryers

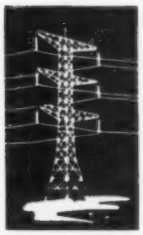
The new 3-cycle Hotpoint dryer combines true automaticity and complete flexibility to give *all* fabrics the specialized care they need. And, because the homemaker can use the Hotpoint 3-cycle dryer for *all* fabrics, you enjoy extra load and revenue.

CLOTHES MINDER CYCLE for regular fabrics—"measures" moisture, turns off dryer when clothes are dry.

DRY 'N WEAR CYCLE dries "wash-and-wears" without wrinkles.

SELECT-O-TIME CYCLE dries special items. Includes **TUMBLE ONLY**.

LIVE BETTER ELECTRICALLY



LOOK FOR THAT **Hotpoint** DIFFERENCE

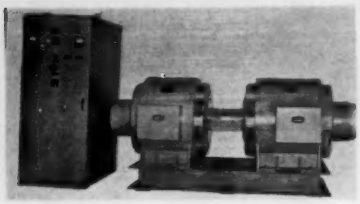
A Division of General Electric Company, Chicago 44,

New products

Frequency changers available up to 250 kw

SYNCHRONOUS MOTOR driven frequency changers with 400 cycle, 3 phase, output are now available as large as 250 kw from Kato Engineering Co., Mankato, Minn.

The units consist of a 150 kva, unity power factor, 120/208-volt, 3-



phase, 4-wire, 400 cycle alternator mechanically connected in tandem to a 250 hp, 440-volt, 3-phase, 60 cycle, 1200 rpm synchronous speed drive motor. Both motor and alternator are dowelled to the structural steel base.

The control cubical contains all necessary metering, circuiting, and synchronous motor starter for the motor. A matching panel contains necessary automatic voltage regulator and other necessary controls for the alternator. All necessary control equipment for various applications can be supplied in single or double cubicals as required.

Write P-115 on reply card, page 19.

Aluminum is used in new dry-type transformer line

ALUMINUM is used in all current-carrying components to provide quieter and lighter-weight units for commercial and industrial service in a new line of open dry-type transformers produced by General Electric, Schenectady 5, N. Y. Weight of a typical 1000-kva unit has been cut approximately 1300 pounds, a reduction of 14 per cent, and sound levels have been reduced well below the levels specified in accepted industry standards.

Available in ratings from 300 to 2500 kva, aluminum windings and bus work make the use of welded internal joints more practical, according to company engineers. With the exception of the tap terminals, all internal connections are welded. Tap connections utilizing techniques which tend to reduce aluminum cold flow and lessen connector resistance are employed in the new design.

Other ratings have been reduced accordingly. All units are designed to heights complementing switchgear, and providing uniform unit substation lineups.

Write P-116 on reply card, page 19.

Time delay relay needs no extra vertical space

A PNEUMATIC time delay relay which requires no extra vertical space has been added to its line of 10-amp relays by Clark Controller Co., 1146 East 152nd St., Cleveland 10, Ohio. The relay, type PMT, also features space-saving modular construction and universal poles with isolated contact so that two circuits may be used on one pole, even at opposite polarity.

Addition of the PMT time delay relay completes a line of relays made by the Clark Co. All the relays have uniform vertical height and mounting dimensions. Since extra vertical space is not required for latch and timing mechanisms, any of the Clark relays may be located anywhere in rows on

panels without waste of space. It is not necessary to group relays by size and shape to avoid space waste, so relays may be located according to their function in circuits, simplifying wiring and maintenance circuit tracing.

The type PMT time delay relay is available in 32 variations of five basic models. There are four basic class A models with time delay adjustable from 0.2 seconds to 3 minutes, with repetitive accuracy of plus or minus 10 per cent. A class B model is adjustable from 0.2 seconds to 1 minute, with repetitive accuracy of plus or minus 15 per cent.

The 32 units cover a range of from zero to three instantaneous poles with one or two timed poles, each pole providing one normally open and

They both know the best buy in tape...
ACCURATE TAPES
FRICTION .... RUBBER .... PLASTIC
Send today for our most recent bulletin describing details.
ACCURATE MANUFACTURING COMPANY
GARFIELD, NEW JERSEY

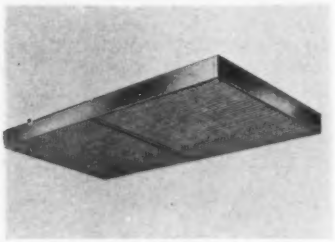
one normally closed contact. All models are available for "on-delay" or "off-delay," and conversion between the two can readily be made in the field. Poles are interchangeable between timed and instantaneous operation in the field.

Design features include all-front access for wiring, inspection, and maintenance, and poles mounted in independent melamine pole blocks which are removable and replaceable without disturbing other poles or their wiring.

Write P-117 on reply card, page 19.

Cleaning problem solved in open-top suspended fixtures

LEADLIGHT FIXTURE Company, 800 100th Avenue, Oakland, Calif., has presented its solution to the problem of dust and dirt collection in an open-



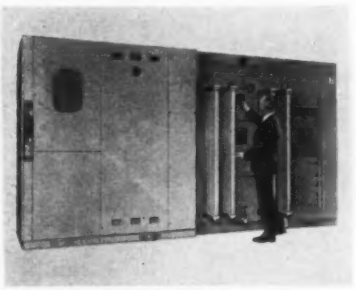
top suspended fluorescent fixture.

Minicell polystyrene, 45 degree—½" x ½" x ½" louvers are their solution to this maintenance problem. Squares, 23⅜" by 23⅜", of this material fit into the functional modular suspended direct-indirect fixtures. Instead of collecting dust, like the vinyl patterns, the dust falls through the louver cells. Open-top fixtures are more economical because of the elimination of the top and its ease in installation due to its lighter weight. This series is to be called the SDLO series.

Write P-118 on reply card, page 19.

Packaged substations offer great savings

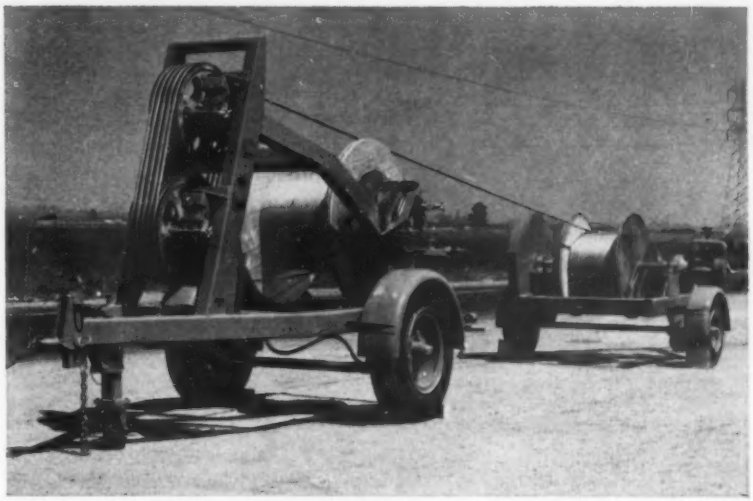
NINE NEW MODELS of its packaged substations have been announced by the Transformer and Rectifier Divi-



sion of I-T-E Circuit Breaker Co., Philadelphia, Pa.

The packaged substations—called Tranfo Units—are pre-engineered

Available Now for Immediate Delivery



PENGO 5000-STR-1 combination tensioner and reel dolly (foreground) has Neoprene-lined bullwheels to take conductor sizes up through .96" (556,500 CM), handles reels to 34"x72" weighing to 5,000 lbs. PENGO 5400 CP-TR Cable Puller (at rear) pulls directly onto reel. It is rated at speeds up to 3 m.p.h. and tensions to 1000 lbs. line pull. For heavier tensions and more positive control, the new economically-priced #5500 PENGO Bullwheel Cable Puller is now available.

...a PENGO Reel Dolly & Bullwheel Tensioner Combination FOR ONLY $3,000!

PENGO's new combination Tensioner and Reel Dolly is available for immediate shipment—permits your use NOW.

Take advantage of this experience to guide you in budgeting these units for your various areas.

Especially designed for small areas, this very economically-priced tensioner eliminates the need for a separate reel dolly—and the extra man.

PENGO offers more than 40 models of Bullwheel Tensioners and Bullwheel Cable Pullers for stringing every size of conductor!

Write today for literature

PETERSEN ENGINEERING CO., INC.
Santa Clara, California

Dept. E-1 8-6

Please send PENGO Tension-Stringing equipment data to:

Name_____

Firm_____

Address_____

City_____ State_____

load centers for stepping down primary voltages. They contain both the transformer and its primary protective and secondary distribution devices.

The units are specially designed for economically meeting electrical distribution needs in such facilities as industrial plants, hotels, schools, churches, hospitals, garages, airports, and office buildings.

The packaged substations offer great savings because: (1) no special engineering time is required, and (2) installation time and expense are cut to a minimum.

Tranfo Units are now available in a wider range of voltage and amperage ratings, in more combinations of primary and secondary devices, and, for the first time, with sealed dry type transformers.

Write P-119 on reply card, page 19.

Ammeter improvements allow easier readings

A NEW TONG TEST ac-dc ammeter with improved features has just been announced by the Columbia Electric Manufacturing Co., 4519 Hamilton Ave., Cleveland 14, Ohio. The ammeter is said to be the only instrument of its type that measures both ac and dc. Engineering changes include a larger damping chamber for each scale range, which makes readings easier by providing improved damping characteristics. Other new features are heavier and stronger scale range construction, insulated operating trigger, and plastic handle.

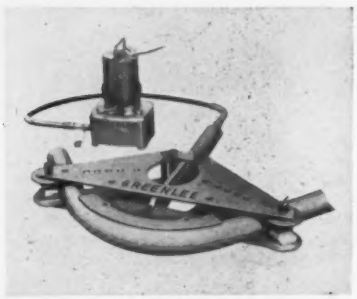
Available in eight types, the Tong Test measures up to 1000 amperes. It is constructed without coils or windings.

Write P-120 on reply card, page 19.

Hydraulic bender features easy one-man portability

THE No. 883 lightweight hydraulic bender that bends ½" - 3" pipe and conduit up to 90 degrees with one fast ram stroke, is now available from Greenlee Tool Co., Rockford, Ill. Designed for operation with either a hydraulic power pump or hydraulic hand pump, the new unit will be used by electricians, pipe fitters, plumbers, and maintenance crews. The new bender features easy one-man portability, setup, and operation. Quick-change positive pipe support pins permit easy front loading. One set of pipe supports rotates to take all sizes. Bender is wheeled from job to job on the pipe supports, which are especially designed to serve as rollers.

The No. 883 combines high-strength aluminum and steel construction for maximum ruggedness with minimum weight. Built-in ram gauge facilitates making identical bends. A separate degree gauge is included. Ductile iron shoe supports spread and equalize

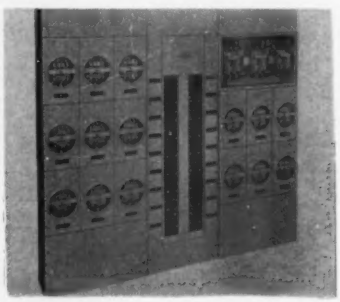


pressure over aluminum alloy shoes. Hose connection is quick-coupling type. Attachments for bending thinwall conduit and bus-bar and a reverse shoe for correcting overbends are available.

Write P-121 on reply card, page 19.

Panelboards pre-wired to save installation time

NEW METER SOCKET panelboards have been recently introduced by Frank Adam Electric Company, 3650 Windsor Pl., St. Louis 13, Mo. These panelboards combine a number of in-

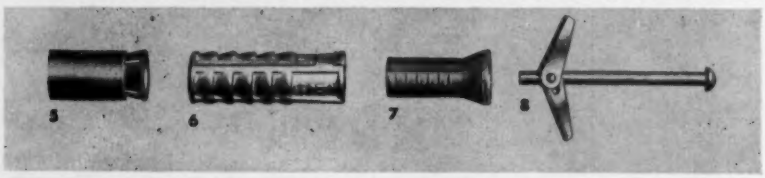


dividual apartment circuit breakers and meter sockets into one compact assembly.

saves time and money

BLACKHAWK'S

complete line of holding, anchoring and fastening fittings



1. Famous Blackhawk Snap-Strap for rigid conduit is a time saver. Has exclusive "hold-bump." Provides rigid contact support.
2. Snap-Strap thinwall conduit — same style as the 700 line made to fit thinwall conduit.
3. Beam Clamps. Heavy gauge pressed steel-plated. Complete with case hardened set screw.
4. Conduit Hanger holds thinwall and rigid. Used with toggle bolt, wood screw and anchor.

BLACKHAWK anchoring and fastening devices

5. CALKING ANCHORS for machine screws, for use in hard brittle material. Caulking tool with each box. (Screws not included.)
6. LAG SCREW EXPANSION SHIELDS of hard zinc alloy, non-creeping. Less bolt binding.
7. WOOD SCREW ANCHORS, tapered rectangular hold causes side shearing action for greater holding power. Screw cuts threads. Use in concrete, tile, plaster or masonry.
8. SPRING TYPE TOGGLE BOLTS zinc plated, double wings lock tightly to screw under pressure. Prevent loosening by vibration. Round head screws, zinc plated, fully threaded.

Write for Blackhawk's complete catalog today.

Blackhawk Industries

BLACKHAWK INDUSTRIES
Dubuque, Iowa
Where The New Ideas Come From

For electrical contractors, installation time and labor are cut through pre-wiring of the panelboards at the factory. Frank Adam meter socket panelboards are custom-assembled at the plant to fill the requirements of each project. Pull-type switches can be substituted for circuit breakers if desired.

Write P-122 on reply card, page 19.

Luminous pastel-colored ceilings now available

LUMINOUS pastel-colored ceilings that provide up to two and one half times the illumination levels usually found in well-lighted areas soon will be seen in stores, hotels, hospitals, banks, and offices. Silvray Lighting,

Inc., of Bound Brook, N. J., has announced it is in commercial production of the new fluorescent system.

Called Colorceil, and utilizing the new Power Groove lamp, the lighting system provides high levels of illumination with complete comfort while permitting luminous ceiling color design in almost unlimited range. It hides all structural ceiling details, such as beams, pipes, and air conditioning vents.

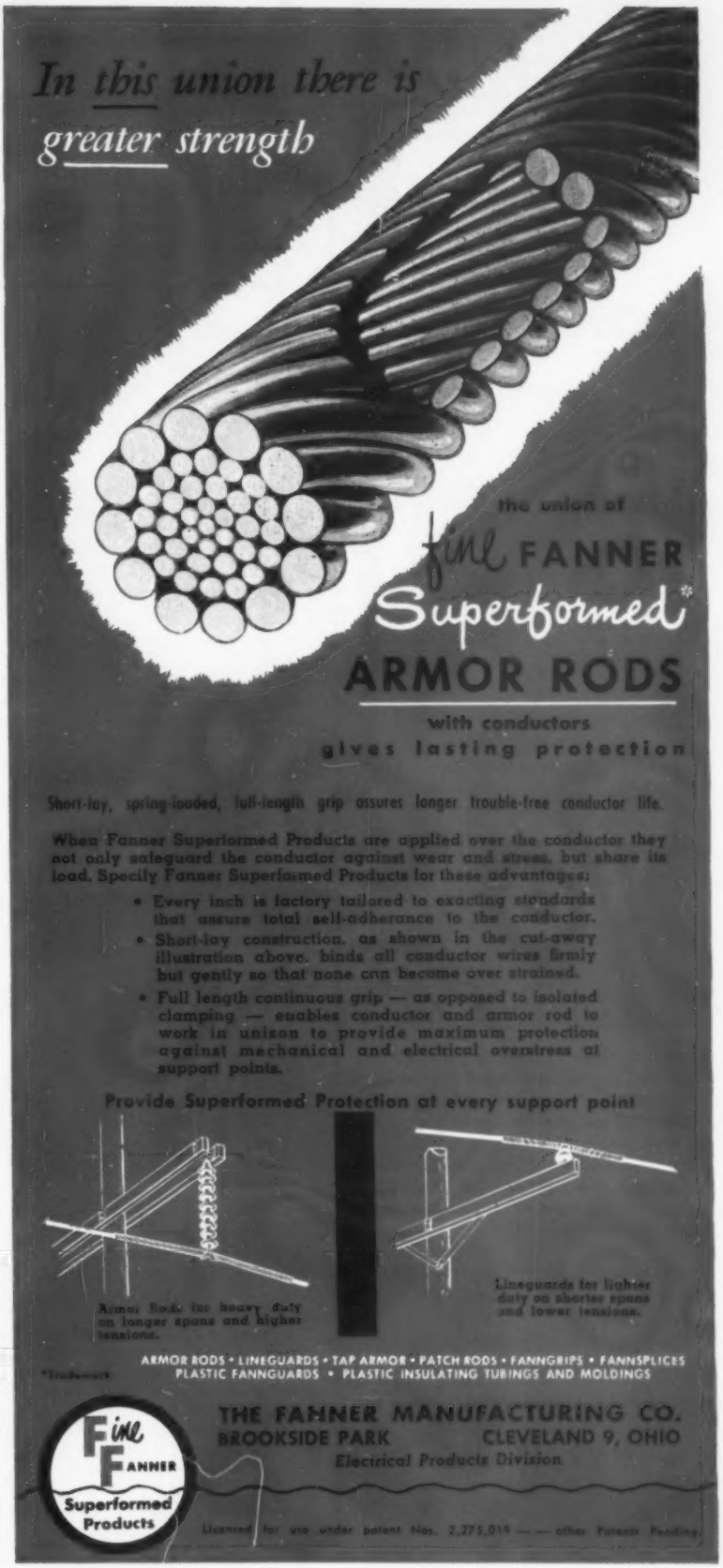
Any desired level of lighting between 100 and 250 footcandles can be achieved. This is done by arrangement of two-lamp units and the use of three different types of high intensity fluorescent tubes, including the Power Groove lamp. The lamps may be used individually or in combination.

Design effects are obtained in two or more colors by merely dropping in "floating" plastic eggcrate panels in desired colors between the lamp units, spaced two feet apart. Special angle brackets are mounted on sides of lamp sections to support the floating panels.

Light from the lamps passes both directly downward to the work surface and upward where it is indirectly diffused through the plastic panels. The light reflected from the ceiling seems to endow the eggcrate plastic panels suspended between the fixtures with a warm color glow unlike anything produced by existing luminaire systems.

Initially, plastic panels in yellow, pink, blue, and green will be available for arrangement in any combination to enhance room decor.

Write P-123 on reply card, page 19.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the union of
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gives lasting protection
Short-lay, spring-loaded, full-length grip assures longer trouble-free conductor life.
When Fanner Superformed Products are applied over the conductor they not only safeguard the conductor against wear and stress, but share its load. Specify Fanner Superformed Products for these advantages:
• Every inch is factory tailored to exacting standards that assure total self-adherance to the conductor.
• Short-lay construction, as shown in the cut-away illustration above, binds all conductor wires firmly but gently so that none can become over strained.
• Full length continuous grip — as opposed to isolated clamping — enables conductor and armor rod to work in unison to provide maximum protection against mechanical and electrical overstress at support points.
Provide Superformed Protection at every support point
Armor Rods for heavy duty on longer spans and higher tensions.
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INTERNATIONAL REGISTER COMPANY
CHICAGO CINCINNATI NEW YORK
307 East Fourth Street, Cincinnati 2, Ohio

Atmosphere lighting effects featured in new fixture line

A VARIETY of shapes, finishes, and mounting arrangements for "atmosphere" lighting effects are featured in the new line of "Accent" fixtures now being produced and distributed by Markstone Mfg. Co., 2460 W. George St., Chicago, Ill.

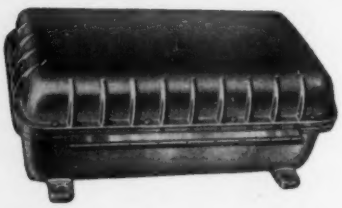
Crafted in aluminum, the new "Accent" numbers are designed to provide "highlight" illumination in

specific areas in homes, stores, offices, showrooms, display windows, convention exhibits, and many other locations. Four basic shapes—step cone, straight cone, and small and large "bullet" shape—are included, for stationary or swivel mounting on walls and ceiling. The complete new Accent line comprises 19 different 1-light and 2-light models, with capacities of 60 to 150 watts.

Write P-124 on reply card, page 19.

Junction boxes designed for rugged performance

NEWLY DESIGNED junction boxes have been announced by Killark Electric Manufacturing Co., Vande-



venter and Easton, St. Louis 13, Mo.

The boxes are constructed of cast aluminum for lightweight, easy handling and are designed for rugged performance.

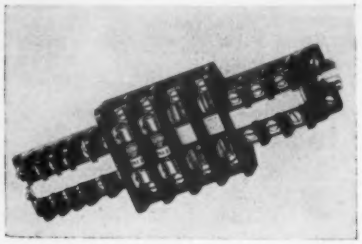
Available in three styles (weatherproof, explosion-proof, and dust-tight) the units can be supplied with hub locations to suit the needs of the customer. Various special features such as hinged covers and flush covers are being offered.

The boxes range in sizes from 8" x 8" x 4" to 16" x 48" x 10", with mounting lugs for efficient installation.

Write P-125 on reply card, page 19.

Fusible terminal block available in kit form

A NEW FUSIBLE terminal block, developed for use in applications where fuse protection is required for solenoids and other single or three-phase



loads, has been announced by Square D Co., 4041 N. Richards St., Milwaukee 12, Wis. Rated at 30 amperes, 600 volts, the new fusible terminal block will accept any ferrule type fuse 13/32" diameter by 1½" long.

This new Type H fusible terminal block is made up of individual sectionalized blocks assembled on a mounting channel with a clamp at each end. It can be combined with four different types of terminal blocks for increased flexibility, and is available in factory-assembled units, or in kit form for customer assembly.

Write P-126 on reply card, page 19.

Electrical caps, connectors molded for durability

HEAVY-DUTY electrical caps and connectors are now being molded of Bakelite QND-5590 polyvinyl chloroide in a specially-designed injection molding machine by Royal Electric Corp., Pawtucket, R. I.

Durability is the feature being stressed in Royal's PVC and PVC Royalok caps and connectors. According to the manufacturer, QND-5590 is virtually unbreakable, resists acids and oils, and stands up under roughest abuse.

The caps, featuring a no-slip grip,

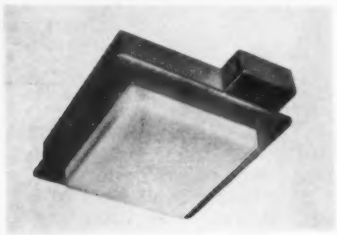
are back-wired to eliminate short circuits caused by exposed conductors—the blades are locked in solid vinyl to prevent anything from

working loose, wobbling, or falling out. The entire connector body is molded without eyelets or rivets—contacts and binding screws are anchored in vinyl and cannot change position or pull out, the manufacturer states.

Write P-127 on reply card, page 19.

Weathertight downlight for wet locations

A WEATHERTIGHT, recessed downlight with an extra-shallow 3" depth was recently announced by McPhilben Lighting Inc., 1329 Willoughby Ave., Brooklyn 37, N. Y. It is con-



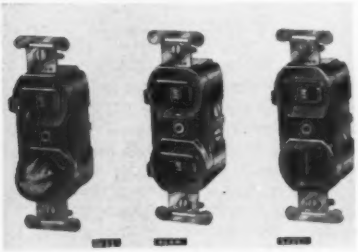
sidered by its designers to be the ideal fixture for locations which are frequently exposed to moisture, such as canopies, entrances, vestibules, and shower rooms. It extends only 1¾" from the ceiling. The light, designated the 4-1215, has cast aluminum trim.

Light leak and ceiling dust streak are eliminated by two neoprene gaskets. It features also a 16 gauge hot-dipped galvanized steel housing which may be used as a pouring form in concrete ceilings, and an external splice compartment for economical, efficient wiring in continuous installations.

Write P-128 on reply card, page 19.

Quiet combination switches available in three series

COMBINATION DUPLEX devices incorporating features of the Leviton quiet switches are now available in three units. They are produced by



Leviton Manufacturing Co., Inc., Brooklyn 22, N. Y.

Included in the 5200 series are a single pole quiet switch, 15 amperes, 120 volts a-c, with power outlet rated 15 amperes, 125 volts; a single pole quiet switch with same rating and pilot light rated 75 watts, 125 volts;

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and two single pole quiet switches on same circuit rated 15 amperes, 120-277 volts a-c.

The Leviton devices feature power outlets with bronze double-wiping contacts for longer life and pressure grip; a pilot light which takes standard, easily removable lamps; rugged construction; quieter operation; and economical installation by permitting use of one-gang combinations instead of conventional-type double-gang.

Write P-129 on reply card, page 19.

Fixture combines styling, performance, modest price

THE SABRE fluorescent fixture has been announced by the Miller Co., Meriden, Conn. The new 2-lamp, 4 ft.

fixture is described as an "unusual combination of distinctive styling and excellent performance at a modest price."

One feature of the Sabre, noted by Miller engineers, is the complete shielding and good brightness control obtained by the one-piece wrap-around refractor of prismatic, clear plastic. Longitudinal prisms, modified by light-baffling crosswise indentations, control brightness to provide comfortable viewing from all angles and yet maintain an over-all efficiency of 74½ per cent.

Installation of the Sabre is said to be simple and easy. In existing buildings present electrical outlets can generally be used. The refractor is readily removed for relamping and cleaning.

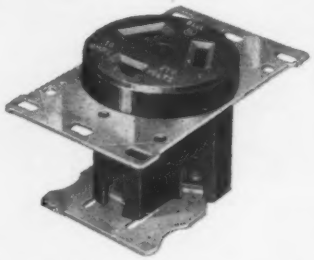
Write P-130 on reply card, page 19.

New line of range and dryer power outlets announced

TWO NEW BELL De Luxe flush power outlets for both 30 and 50 amp. receptacles are announced by Bell Electric Co., Dept. P. O., 5735 S. Claremont Ave., Chicago 36, Ill. They are used in wiring electric range, dryer, and industrial installations, both indoors and outdoors.

New engineering features increase the ease and safety of wiring. Wiring can be done in a short time simply by (1) sliding back plate to open position and loosening set screws, and (2) stripping wire ½-inch and inserting into terminal openings. Set screws are tightened and back plate pushed to closed position. Slidable back plate covers terminals for protection against arcing or shorting. There are no exposed lugs or electrical terminals.

Pressure type terminals prevent the possibility of the wire loosening

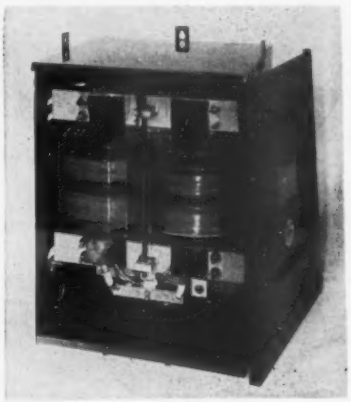


and will accommodate up to No. 6 wire. The new breakoff yoke provides universal adaptability. Ears, scored at corners for easy breakoff with pliers, provide perfect seating and fit of outlet in all types of F. S. boxes. Multiple screw holes in yoke permit varied types of mounting.

Write P-131 on reply card, page 19.

Saturable core reactor allows varied reactance

A FULL-RANGE saturable core reactor, which provides controls for varying its reactance by making



changes in a comparatively small amount of direct current in a control winding, is currently in production at the Pittsburgh works of Allis-Chalmers Mfg. Co., 1126 S. 70th St., Milwaukee 1, Wis.

The reactor can also provide partial range control whenever this is desired. In some cases, according to the manufacturer, the saturable core reactor can also be used instead of an induction regulator.

The line will range from 25-kva through the largest commercially required, and in dry-type and oil-filled designs for indoor and outdoor applications.

Write P-132 on reply card, page 19.

FOR DEPENDABLE LONG-LIFE OPERATION
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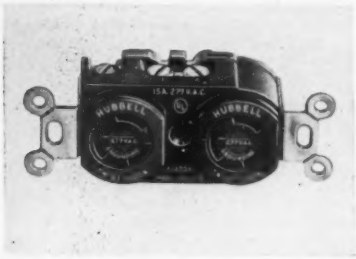
Dallas Warehouse
PEABODY BROTHERS
3015 Taylor St.
Dallas, Texas

Duplex outlet saves fixture installation time

A NEW LINE of caps and receptacles from Harvey Hubbell, Inc., Bridgeport 2, Conn., provides positive grounding plus "Twist-Lock" protection. It is designed for 3-wire, 15 amp., 277 volt circuits, widely



used for fluorescent lighting. These devices (listed as the 4750 series) are grounding "Twist-Lock" units expressly made for 277 volt applications.

A special configuration guarantees non-interchange with (1) regular "Twist-Lock", (2) 4700 line (15 amp., 125 volt) "Twist-Lock" and (3) any other devices on the market.

This duplex outlet offers savings in fixture installation time and money because it can be used to feed two fluorescent lighting fixtures from one single gang box. As a result, it cuts the required number of devices in half, cuts number of boxes in half, and saves on both fixture installation and maintenance.

Write P-133 on reply card, page 19.

Forced-air type wall heater combines economy and safety

DESIGNED FOR USE in the modern home where there is not enough room for a large standard size heater, the Chromalox circulating air electric heater, type CB fits into the wall and extends out less than ½ inch. Manufactured by the Edwin L. Wiegand Co., 7500 Thomas Blvd., Pittsburgh 8, Pa., the slimline heater finished in gleaming chrome employs a built-in thermostat with off position switch which automatically maintains room heat level.

Safety is a prominent feature of the small but powerful heater. Closely spaced louvered grill provides protection from shocks and burns. The smooth-running low-speed fan cannot cause radio or TV interference. Proper room temperature is assured because the sensitive thermostat is shielded from the radiant heat of element so that it measures the room temperature, not the heater temperature. Its designers note that the small size of the Chromalox heater allows it to fit easily into the smallest bath, nursery, kitchen, workshop, playroom or basement.

Write P-134 on reply card, page 19.

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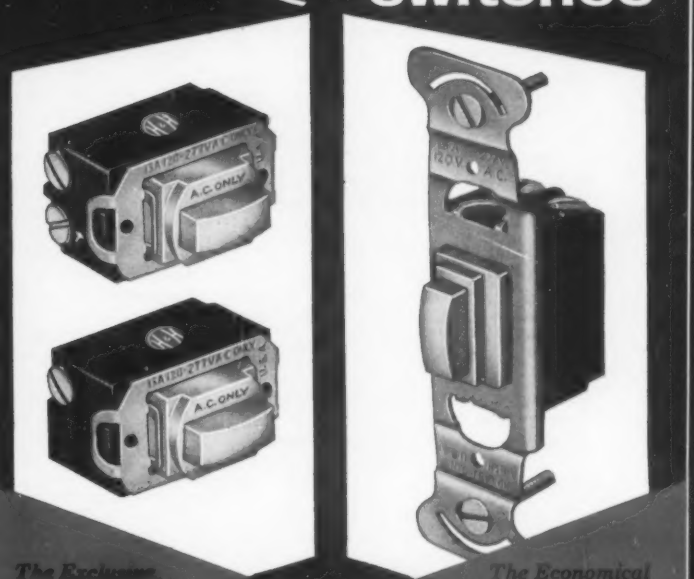
With these TWO New Quiette® switches



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All three switches in this complete line — the compact and inexpensive new *Junior*, the versatile new *Interchangeable* produced *ONLY* by Arrow Hart — and the built for a lifetime Senior — tap on or off with the gentlest pressure of fingertip, hand or elbow anywhere on the button. All feature quiet mechanical action, operate on full voltage without relays, and provide safe control for incandescent or fluorescent lights . . . and for household appliances. Designed to effect important space savings that assure ease of wiring . . . and to provide electrical convenience at its finest . . . they are truly tomorrow's switches available *today!*

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Free bulletins

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Formerly known as Howarduct, the **Spang Standard Underfloor Duct,** is introduced by the Spang-Chalfant Division of the **National Supply Co.,** Two Gateway Center, Pittsburgh, Pa., in an eight-page, illustrated bulletin featuring its simplicity in the distribution systems for electric power, telephones, and inter-coms.
Write B-135 on reply card, page 19.

Illustrating and describing their complete line of **fluorescent, incandescent, and floodlighting fixtures,** the **Electric Lighting Corp.,** 1535 S. Paulina St., Chicago 8, Ill., has issued a new 112-page catalog, which includes data on commercial, industrial and outdoor fixtures.
Write B-136 on reply card, page 19.

A four-page, two-color catalog, made available by **Fluorescent Fixtures of California,** 352 Shaw Rd., South San Francisco, Calif., describes its **Deluxe Industrialist fixtures,** series 80 and 81. With many advanced features, these fixtures have been designed to provide high light utilization. Special features and specifications of the fixtures are included in the catalog.
Write B-137 on reply card, page 19.

Section 11 of Bulletin 38-E on power connectors for copper conductors has been enlarged to include **information on aluminum power connectors.** The bulletin, available from **H. K. Porter Co., Inc.** Delta-Star Division, 2437 Fulton St., Chicago 12, Ill., has a 51-page section on all new designs for aluminum.
Write B-138 on reply card, page 19.

Recently announced by the Pole Hardware Division of **Malleable Iron Fittings Co.,** Bransford, Conn., is a new 12-page **catalog of pole line hardware for the telephone industry.** The booklet describes the complete line of MIF hooks, guy and cable clamps, as well as other equipment, explaining how lower installation costs and simplified maintenance are effected by recently developed design changes.
Write B-139 on reply card, page 19.

Sola Electric Co., 4633 W. 16th St., Chicago 50, Ill., has issued an up-to-date **fluorescent ballast replacement guide.** The chart, printed on heavy stock, is a three-page fold-out suitable for hanging on the wall. It lists Sola replacements for other brands of ballasts and also notes other brand replacements for Sola ballasts.
Write B-140 on reply card, page 19.

Availability of a new Bronco 66 Certified **portable electric cable** condensed catalog is announced by the **Western Insulated Wire Co.,** 2425 East 30th St., Los Angeles 58, Calif. Differences distinguishing one type of portable cable from another are pointed out. Basic construction of the Bronco 66 Certified is described in some detail. The back of the brochure give data frequently needed by electrical engineers.
Write B-141 on reply card, page 19.

Manufacturers of electrical power equipment will soon receive a handy guide to the complete line of **electrical terminal connectors** from the **Anderson Electric Corp.,** P. O. Drawer 2151, Birmingham 1, Ala. A convenient feature of the new catalog is a completely tabbed thumb index which shows at a glance the location in the catalog of each class or type connector. A special design section is devoted to non-standard connectors that can be made up from standard component parts. Thus, by referring to this "Designs from Components" section, an engineer can specify and order connectors for unusual or special applications.
Write B-142 on reply card, page 19.

Allied Radio Corp., 100 N. Western Ave., Chicago 80, Ill., distributors of radio and electronic parts and equipment, announce the release of their **1959 general catalog.** Allied's new 452-page catalog (208 pages in rotogravure and 4-color covers), lists over 32,000 items. Special emphasis has been placed on equipment for industrial maintenance, research, and production requirements.
Write B-143 on reply card, page 19.

A 24-page bulletin from **General Electric Co.,** Schenectady 5, N. Y., gives original equipment manufacturers a complete reference for selecting small power and control, general-

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(January 1959)

purpose and special-purpose **transformers.** The illustrated bulletin contains a complete description of each transformer type including typical ratings, prices, and detailed application information on each type of product according to industry and market area.

Write B-144 on reply card, page 19.

A new two-color, pocket-sized **panel selector handbook** (1-125PC) has been issued by **Federal Pacific Electric Co.,** 50 Paris St., Newark, N. J.

Designed to help architects and electrical contractors instantly determine the proper enclosures for a specific application, the 44-page selector handbook gives complete information on Stab-lok enclosures, brief descriptions of Stab-lok circuit breakers, and complete wiring diagrams.

Write B-145 on reply card, page 19.

Simplex Wire & Cable Co., Cambridge 39, Mass., has published a new catalog for **C - L - X sheathed cable.** The catalog, indexed for easy reference, describes the construction features of C - L - X, gives engineering data and test results, describes applications, gives typical diameters and ordering information.

Write B-146 on reply card, page 19.

A new, complete **underfloor raceways** catalog has been published by **National Electric Products Corp.,** 140 Stanwix St., Pittsburgh 22, Pa.

Attractively and clearly illustrated with drawings and photos, this 52-page catalog gives complete information about every type of underfloor distribution system. Also included is a full line of service fittings, boxes, and saddle supports.

Write B-147 on reply card, page 19.

A multi-color brochure highlighting a new **wall lamp collection** is being offered by **Globe Lighting Products, Inc.,** 1710 Flushing Ave., Brooklyn, N. Y.

The new illustrated brochure includes specifications of fourteen new traditional and contemporary fixtures designed for use in living room, dining room, and study areas. The brochure features line drawings of the new fixtures in different use situations in the house.

Write B-148 on reply card, page 19.

Design and construction features of their automatic **reduced voltage starters** are described in a new bulletin released by **Allis Chalmers,** Milwaukee 1, Wis. Included is motor control engineered for centrifugal compressors, hammer mills, pumps, large conveyors, large fans, motor-generator sets, and other applications. Covering the range of automatic reduced voltage starters from 50 to 1200 hp, 600 volts, the bulletin carries descriptive copy on the theory and operation of low voltage starters. In explaining the need for the use of low voltage starters, the bulletin lists the advantages of autotransformer, closed transition connection (Korndorfer), primary resistor and reactor, part winding, and star-delta starters.

Write B-149 on reply card, page 19.

James R. Kearney Corp., 4236 Clayton Ave., St. Louis, Mo., is offering a new catalog showing its full line of open type drop out **distribution cutouts** rated 5.2 to 34.5 kv with Type G double venting or Type GX pressure controlled venting cartridges.

Write B-150 on reply card, page 19.

A new bulletin describing its Type PV **power switches,** is now available from **Line Material Industries,** Milwaukee 1, Wis. The bulletin gives complete information on switches rated at 600 or 1200 amperes and having voltage ratings from 7.5 kv to 69 kv.

A new universal-mounting base, now a standard feature on all L-M switches, is also described in detail in the new bulletin. The universal-mounting bases eliminate special drilling of base or structure. They are easily adjusted to a wide range of mounting dimensions.

Write B-151 on reply card, page 19.

A new booklet combining technical information and a catalog of **flexible cords** and portable cables, is being offered by **The Okonite Co.,** Passaic, N. J.

Bulletin 1108 is an all-new 64-page manual that deals completely with Okonite's line of mold-cured Okoprene (neoprene) sheathed cords and cables. The book's main divisions give dimensional data, engineering information, and splicing and terminating instructions.

Write B-152 on reply card, page 19.

A six-page folder on plastic insulated and jacketed **control cable** (rated 600 volts) has just been issued by **Chester Cable Corporation,** Chester, New York. It lists the specifications of small diameter - station - flexible and supervisory control cables with 2 to 19 conductors. Also included are IMSA municipal signal

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Adjustable Watertight Floor Boxes

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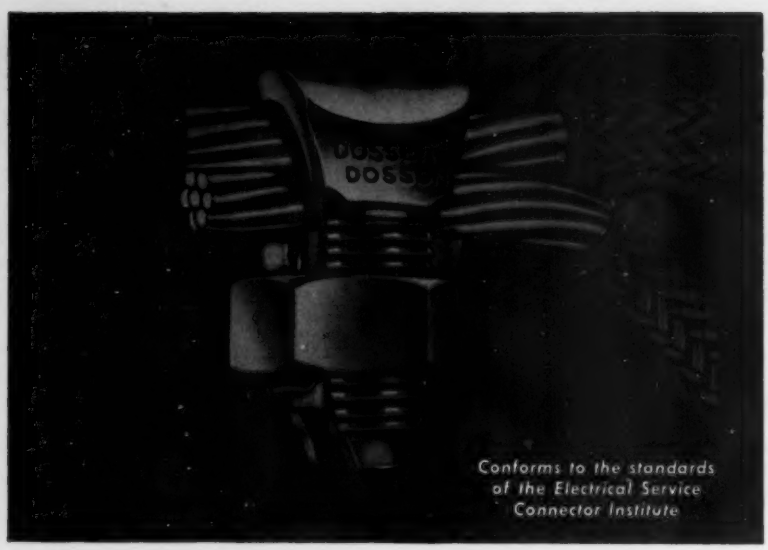

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Fabricated from high strength alloys (better than average steels), the Dosson "F" is cold-formed for uniform quality. Maximum contact pressure is assured by a high translation of tightening torque. Full length pressure bars with rounded edges prevent load concentration and crushing of conductor. Built to withstand high overload, vibration. Highly corrosion resistant.

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cables, specifications 19 and 20 - 1956 with 3 to 12 conductors. Chester offers color coding, jacketing, and insulation in accordance with prescribed standards.

Write B-153 on reply card, page 19.

"An Electrical Engineer Comes to Crouse-Hinds" is the title of a new 6-page folder by **Crouse-Hinds Co.**, Syracuse 1, N. Y. The bulletin describes design and construction principles involved in manufacturing Crouse-Hinds **condulet electrical equipment** for hazardous locations. Also emphasized is the great variety of explosion-proof equipment in everything from lighting to motor controls.

Write B-154 on reply card, page 19.

"More kilowatts per dollar" is the theme and title of a new publication by **Aluminum Company of America**, 1501 Alcoa Bldg., Pittsburgh 19, Pa.

The 34-page brochure discusses architectural, mechanical, and electrical **uses for aluminum** in electrical power generating stations. It is illustrated with pictures of aluminum in service in power plants. The booklet discusses sixty types of applications where the use of aluminum means initial, installed, or service-life savings to the user.

Write B-155 on reply card, page 19.

Edwin L. Wiegand Co., 7500 Thomas Blvd., Pittsburgh 8, Pa., offers a new bulletin which illustrates and describes the company's line of Chromalox Thermwire electric **heating cable, tape, and band.**

Abundantly illustrated with installation diagrams, the booklet is intended to serve as a quick guide to the selection of the proper equipment for winter applications. It includes complete specifications and prices.

Write B-156 on reply card, page 19.

EJS Lighting Corp., 921 East Pico Blvd., Los Angeles 21, Calif., announces the publication of its new **lighting fixture catalog.** The color booklet is divided into four sections —residential, architectural, and special design, bullets and portables. It is carefully merchandised for the convenience of engineers, architects, builders, decorators, and contractors as well as retailers. The catalog pictures hundreds of designs in the EJS line.

Write B-157 on reply card, page 19.

Cable trays and support systems for all types of cables, wiring, and tubing are illustrated and fully described in Catalog No. 858 by **P-W**

Industries, Inc., Duncan & Melrose Sts., Philadelphia 24, Pa. Channel side trays with expanded metal or solid bottoms and ladder type, in galvanized steel and aluminum, with appropriate fittings and accessories, are included. Diagrams, installation information, and loading charts are also given.

Write B-158 on reply card, page 19.

A new 8-page bulletin, GEA-6671, from **General Electric,** Schenectady 5, N. Y., describes the features and operation of General Electric's complete line of Type HR **automatic reclosers** which provide economical overcurrent protection for suburban and rural distribution systems. It includes charts, curves, photographs, and rating tables. The new HR Reclosers are available in both single and three-phase units at 14.4 kv and 23 kv with a full complement of coil ratings.

Write B-159 on reply card, page 19.

Product uses, features, and manufacturing processes of **electric metallic tubing** by **Rome Cable Corp.,** Rome, N. Y., are detailed in a new 12-page bulletin.

Bulletin RCP-900 covers, in detail, a complete story of electrical metallic tubing as it is produced in the Torrance, California plant of Rome Cable Corp.

Recommended applications for the color-coded lightweight (thinwall) raceways for protecting electrical wiring systems are outlined for residential, commercial, institutional, and industrial construction where heavier rigid conduit is not required.

Write B-160 on reply card, page 19.

Crouse-Hinds Co., Syracuse 1, N. Y., announces a new **floodlight catalog** (14 sections, 184 pages) to become available late in January, 1959. It is the first completely new floodlight book issued by Crouse-Hinds since 1952.

Aim of the catalog is to provide adequate descriptive and ordering information in clearly-presented form, with information easy to find and to use. Several sections are entirely new, such as the sections on "How to Select Floodlights" and "Mercury Vapor Floodlights," other sections contain items formerly listed, plus additional new products.

Write B-161 on reply card, page 19.

Electric industry

(Continued from page 23)

home use of electricity. Approximately two-thirds of the Institute's member companies are already participating in this promotional enterprise with some $2½ million pledged for the 1959 program, which will be launched during National Electrical Week, February 8-14.

The program is designed to represent a rallying point for manufacturers and other trade allies in the electrical field to concentrate and coordinate their selling efforts in the residential market. EEI plans to use national television, newspapers, magazines, and other media in carrying out this new program. With this basic activity, strongly supplemented by the integrated advertising and promotion efforts of electrical manufacturers and others, the industry expects to achieve a new effectiveness in selling electrical living at both national and local levels.

The electric utility industry in 1958 continued its substantial efforts to hasten the day when economic electricity from nuclear fuels can be produced. One of the most significant steps toward this goal was the formation in November of the largest nuclear power group in the United States—High Temperature Reactor Development Associates, Inc. Composed of Philadelphia Electric Company and more than 50 other electric utility companies, HTRDA has offered to develop and build a high-temperature, gas-cooled nuclear power plant which may provide a short cut to the goal of economic nuclear power.

Philadelphia Electric Company and HTRDA will spend $24.5 million to construct the 40,000-kw prototype plant which would be completed in 1962 or early in 1963.

Construction and operation of such a plant was viewed by the electric industry as an important step toward the achievement of economically competitive atomic power.

In addition to being the largest nuclear group in the United States, HTRDA is the most widely representative group of U. S. utility companies to support a single nuclear power project thus far.

Nuclear power research

One hundred twenty-nine electric utility companies, serving most of the nation's consumers, were participating in one or more of 28 nuclear power research, develop-

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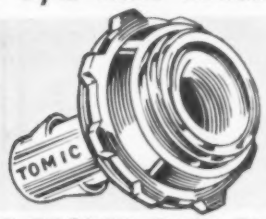

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ment, and construction projects or studies at the end of 1958.

Late in 1957, the world's first full-scale atomic power plant devoted exclusively to peaceful uses went into operation at Shippingport, Pa., and early in 1958 the plant was developing more than 60,000 kw of power for the city of Pittsburgh. Its ultimate capacity will be even greater.

Since 1954 when Congress passed a new Atomic Energy Act which permitted industry to develop and construct its own nuclear power plants, electric power companies have embarked on a substantial number of nuclear projects. This expanding program, carried on in cooperation with the manufacturers and AEC, at present includes 16 announced nuclear power plant construction projects involving a total utility company investment of more than $540 million. There are also 12 other nuclear research, development and study projects calling for continuing expenditures of additional sums of money. One research program is a multi-million dollar project in the field of controlled thermonuclear (fusion) reaction.

Of the 16 nuclear power construction projects, three are now in operation, producing power being utilized on company systems. Another six projects are either under construction or contract, while the remaining seven are in various planning stages.

Electric power in Russia

In spite of Russian claims, Soviet total electric generating capacity is less than the total of new capacity installed in 1958 and to be installed in the next three years by the U. S. electric industry.

The total installed capacity in the USSR as reported by the Soviet Power Ministry was 48.3 million kw at the end of 1957. During the four years, 1958, 1959, 1960, and 1961, the United States will install a total of more than 50 million kw of new capacity.

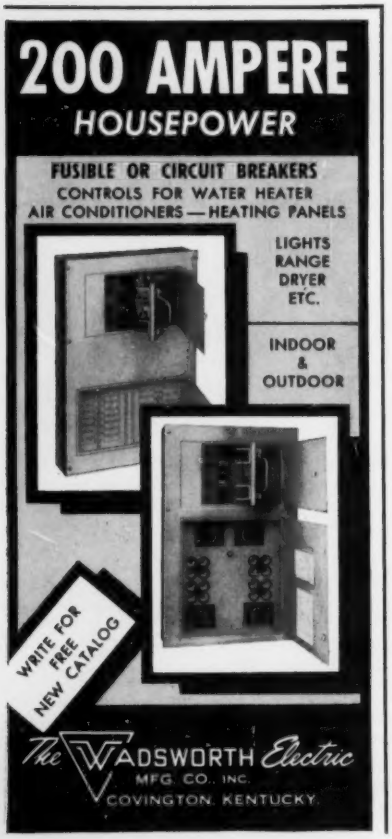
Premier Khrushchev announced in November that the Soviet government expects annual Russian output of electric power to reach 500 to 520 billion kwhr in 1965. By the same year, United States output is expected to reach 1¼ trillion kwhr annually. In considering a comparison of this kind, it should be recognized that the Russians have a history of consistency in failing to reach goals such as they have set in electric power, while in the U. S., the electric industry has a long-established record of making carefully considered predictions and then exceeding them in actual growth.

In electric generating capacity, the Soviet Union has announced plans for adding 60 million kw by 1965. The total to be reached by that year would be 108 million kw for Russia, if their expectations are met. This compares with an estimated 250 million kw which the United States will have installed by 1965.

The Soviet Union plans to add an average of about 7½ million kw of capacity a year to 1965. During the same period, the United States will be adding an average of over 14 million kw annually.

Total electric sales per capita in the U. S. in 1957 were four times those of the USSR, but residential and rural sales per capita were six times those of Russia.

In 1957, the United States generated about 4,180 kwhr of electricity per capita. Russian per capita production in the same year was 1,045 kwhr. Soviet output per capita now is about where the United States was in 1938—some 20 years behind. (Chart 2)



Analog computer

(Continued from page 45)

generation for quoting interchange sales by the integration of incremental cost over the full range. All system conditions, including system load, are continuously variable over the entire range, and any given machine can be switched into or out of the computation at will.

Among the varying factors dealt with by the computer are turbine back pressure, spinning reserve data, cooling water temperature limitation, effects of hydrogenation, changes in fuel costs and tie-in line sales.

The load distribution analog computer operates on standard 115 volt, single phase, 60 cycle power, with a current drain of less than 5 amperes.

Balancing phases

(Continued from page 47)

when the line is routed across-country where there are no streets or roads.

In those cases in which the line is constructed without definite positions being assigned to each phase, the conductor may be identified by permanent markers, such as aluminum letters, attached to either the cross arm or the pole. These markers may be placed on each pole; or a modified method may be used whereby the markers are placed only at strategic locations, such as corners and break-offs.

If wires of the bare type are not located so that they may be identified by position, and markers are not used, it then becomes necessary to depend on map-records. The planner may provide sufficient information on a sketch for the workmen to determine the identity of the various phases when connecting transformers; or it may be necessary to provide the line crew or each lineman with a complete map record of the entire primary system, with the phase identity shown on the maps for each circuit.

When the conductors are of the insulated, or covered type and are bundled or cabled together, either on a messenger wire or in a common sheath or conduit, the above methods of identification can no longer be used. Under these circumstances, color coding may be employed.

The entire jacket, or covering, of

the individual conductor may be colored, or a coded stripe may be superimposed on the outside of the covering. In some cases a raised bead, or ridge, with a color-coded marker inside extends the length of the phase wire. The workman cuts a V-shaped notch in the ridge to detect the color of the marker.

Sometimes multiple ridges on the covering of the wires identify them; for example, one ridge on "A" phase, two on "B" phase and three on "C" phase conductor. It is also possible to print or emboss letters or numbers at regular intervals on the outside of a cable at the time it is manufactured.

The usual method of identifying the phase of a lead-covered, single-conductor cable, is to tag it with a metal, plastic or porcelain tag, into the surface of which the phase and circuit number have been stamped. The individual phases of a three-conductor, lead-covered primary cable are not, as a rule, marked for identification in any way. When identification is necessary, the cable is usually out on a clearance and the conductors are accessible at the point where the work is being done. The usual procedure is to "ring-out" or "talk-out" the various phases in order to establish their identity.

If the cable is connected to a primary grounding switch, the grounding contacts may be modified or adjusted so that it may be employed in identifying the cable phases by grounding them in a known sequence. For example, as the switch moves into the ground position the "A" contact closes first thereby grounding the "A" phase. As the switch continues to move toward its final position the "B" contact and the "C" contact close in sequence.

When a sequence grounding switch is not available, a quick and easy method of gaining access to the cable phases is provided by the installation of pipe plugs in the switch cover directly over the switch poles, as shown in Figure 2. One half of a pipe coupling, cut on the bias, is welded to the switch cover opposite each phase and above the oil level. It is so aligned that when a hole is drilled in the cover, through the coupling, a probe inserted through this opening will contact the desired phase so that it may be grounded or "talked-out". When not in use the coupling is closed with a pipe plug. This feature is now being provided by the switch manufacturers and the customer may obtain switches with pipe plugs installed at the factory.

Should it be necessary to identify the cable circuit before starting to work upon it, or should it be desirable to locate the position of the different phases inside the cable sheath before the cable is cut into, this can be done by employing special equipment designed for that purpose. This equipment places a coded and polarized signal on each conductor of the cable at the substation from which it originates. By passing a polarized exploring coil connected to a suitable galvanometer over the surface of the cable sheath these signals may be picked up and used to make the desired identifications.

Custom-built home

(Continued from page 25)

returning to add a switch.

The contractor undertaking a custom home wiring job should see complete plans (floor plans are not enough) for a better understanding of what lies ahead. This will spare his making unnecessary changes and tearing out wires. Many headaches can be avoided if complete plans are fully presented and realized.

Wiring the home of modern design is a new challenge to the ingenuity and resourcefulness of the electrician.

Handling service

(Continued from page 27)

shop by sending him a bill a month later, at which time the actual length of the time charged to the job is forgotten in view of the satisfactory performance of the job. All we do is render the bill without itemizing it to the point where it is detailed to death and leaves you wide open for explanations as to the reasons therefor."

Corbett cautions to "watch profits, not volume" of outside service work. His experience is that the reason for continuing losses or a poor profit picture on outside calls stems from failure to take into account the extraordinary costs which they involve.

"The cost of doing business as a contractor doesn't begin to reflect his cost of doing business in the field of outside service," he says. "Thus the traditional mark-up on

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the sale of an element for a water heater at $9.80 may recover all of the contractor's cost of doing business and yield a fair profit. But the same markup applied only to the labor cost of making a service call will result in a loss. And this loss must come off the contractor's wiring profits.

"You cannot safely use the same formula to price wiring jobs and outside service calls, because then even the parts and material sales made to the customer may still not turn the loss on labor into a profit."

Determining costs

In determining what it costs to make a service call, a few of the items that must be considered in its charge are listed by this Florida contractor: serviceman's wage, allowing for non-productive time; fringe wage costs borne by the contractor; tool, equipment, and inventory investment on the truck, including depreciation, repairs to same, and occasional loss; truck investment and depreciation; truck maintenance including insurance coverage, gas, oil, and repairs; and cost of making free callbacks and adjustments.

In addition to the foregoing, outside service calls must bear their fair share of store or shop expense traceable to the service volume. These include advertising, rent, phone charges, bookkeeping, electricity, heat, management salary, etc.

Whether the service volume traceable to outside calls is large or small, the foregoing items of expense will remain substantially fixed percentage-wise. Corbett feels that it is unwise to dismiss service call losses as negligible simply because they do not stack up as a large item in a year.

Steps to profit

In line with Corbett's experience and that related by other contractors, the following are a few steps worth considering to get a service department established on a sound and profitable basis. These are designed to bring order into a service department and to insure that if profits are available, they will find their way into the contractor's till.

1. Set up a separate account for each service truck's inventory stock, charging all items at resale price.

2. Credit the truck with parts and material sales at selling price and charge stock replacements to the truck.

3. Insist that the serviceman replenish his truck stock only through a check by another employee if not the contractor himself.

4. Use serially-numbered, duplicating job tickets. Make certain that all tickets are accounted for, including those voided through writing errors. Charge tickets, according to serial number, to the service truck.

5. Periodically analyze job tickets for total time charges. This may indicate whether a complete recovery is being made on a serviceman's time. There may be one or more calls a week which never show up on job tickets, and this can represent the difference between profit and loss on the outside service operation.

6. Analyze job tickets from the standpoint of simple arithmetic. Too often a contractor or his bookkeeper looks only at the total against the amount of billings. Check material prices and labor charges as well as addition. Some servicemen are prone to errors at the boss's expense.

7. Keep a log of all service calls and check these against job tickets turned in.

8. Listen carefully to complaints of customers asserting they have been overcharged. Get out copies of the original job tickets and compare them with job tickets held by the customers. There may be discrepancies. This is an old trick long known to CPA's searching for losses. It not only accounts for losses in earnings, but losses in customers.

9. Give careful consideration to customers claiming they paid for service work at the time the job was done, even if, as in Corbett's case, is it against your policy. If enough complaints come in, the customers may be right.

10. Insist on a regular end-of-the-day accounting by each serviceman. Make him aware that he is subject to time and material accounting. It is the contractor's time and material!

11. Occasionally check truck speedometer readings. If a serviceman takes 8 hours to make only five or six simple service calls, could be he is doing some work of his own on the side as a sideline, with the contractor footing the bill.

12. Finally, if a serviceman is being given full-time employment, as is the case with the Corbett firm, he should be discouraged

from pursuing service work on his own time after working hours. In the first place, such outside activity is likely to depress the level of prices for service work, because the serviceman will charge less than his boss on the erroneous assumption he has no overhead. Secondly, besides competing with his boss, there is a good likelihood his employer will underwrite him with "borrowed" tools and equipment, if not with parts and materials.

Says Corbett: "Some of our customers had been complimenting us on the nice work we were doing in a neighborhood where we weren't operating. We discovered that one man and a buddy had wired 7 houses on the side!"

From the foregoing suggestions and the views of this veteran Florida contractor, it can be noted that outside service requires a degree of supervision and time. However, as in Corbett's experience, this outlay of effort is the lesser of two evils.

The alternative is continuing losses from outside service calls, and decreased profits from merchandising.

Interlocked armored cable

(Continued from page 36)

tire installation including the transfer of load from the old service to the new with only one-hour interruption of operation.

We had a previous experience with steel armored cable in an air conditioning job at the Kennedy-Warren apartment building. We had to run cable through the basement garage and up and down different elevations and shaftways. Use of the garage was at no time interrupted during the installation of cable. However, at the Shoreham we first discovered how much more flexible and economical through lower labor costs interlocking aluminum cable was than conduit and wires.

Medallion homes

(Continued from page 26)

Visitors were urged to inspect the unfinished house and see the wires and circuits that go into a home that has certified adequate wiring. In this unfinished house the Price-Fewell electricians received the visitors, explained the value of a separate circuit for each major appliance, told them that a spare circuit had been provided for at least two future 120-volt, 20-ampere circuits, and helped each visitor understand the value of adequate wiring.

Most people have read enough about adequate wiring to be interested. Seeing the skeleton circuits in an unfinished house, explained by a courteous electrician had a telling effect on sales for those units in the development that were still not built or sold. Visitors asked intelligent questions of the electricians and of representatives of the Adequate Wiring Bureau, and then often returned to the finished houses to check again the electrical kitchen, with its built-in table top range and built-in ovens, the dishwasher, garbage disposer, vent fan, properly placed switches, outlets, and lights. They showed renewed interest in the utility room, with its washer and dryer, and the 3½ ton air conditioner that provides electrical cooling.

Builder Joe Kaufman readily admitted that the cooperation of the utility company, the Adequate Wiring Bureau, and the Price-Fewell electricians, on the scene,

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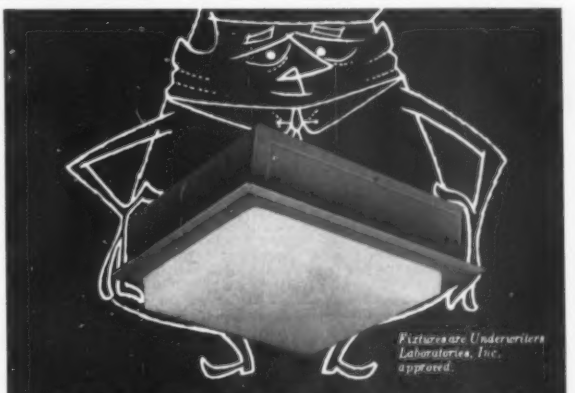

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helped to spotlight the Housepower and the Live Better Electrically themes that are behind Medallion homes.

Medallion requirements

Conforming to the Medallion layout, all of the 32 homes required a minimum 100 ampere service capacity in homes where over three tons of air conditioning is installed or provision is made for electric heat. Actual electric heat installation in the development is an additional benefit arranged with the buyer. Although the show house was not equipped with heat pump or resistance heating, several prospective home buyers showed their interest in electrical heating, and some of the 32 units probably will have it.

Said the partner in the contracting firm wiring the development, "We are getting ready for the electrical living that home owners want, and the selecting and train-program that we have for our electricians is turning out the kind of men we need to perform quality work for quality homes. We pick our boys carefully, instruct them constantly in the most modern methods, hold special schools for them from time to time, and let them share our profits with an incentive compensation program that keeps them interested.

"The fifteen men working on the Plaza Terrace Medallion homes project are more than skilled electricians. They are ardent salesmen for what the metal medallion displayed before each home symbolizes—Better Electrical Living."

Showroom aids

(Continued from page 29)

cations on heating and lighting equipment and other types of special electrical installations.

A large stock of motors, motor controls, special devices, fittings, and all kinds of industrial electrical supplies are carried. These are available to plants in the area for immediate delivery. And, in addition, Kingsport Electric has an organization that is able to layout special control and motor problems, "thereby giving our customers the benefit of what knowledge we might have of their problems."

A stock of repair parts is maintained for everything sold. They are quickly available to the contractor and industrial customer in case of a breakdown.

A service to the retail customer, which in turn helps his sales, is an idea for selling lamp globes, fuses, and other small articles. Two Kingsport Electric Company trucks make the rounds of supermarkets, grocery stores, hardware stores, and other lamp customers within a 50-mile radius. The driver of each truck works on a commission basis, and he shows greater sales than if he were working on a salary.

"These men load their trucks each day and call on our various lamp customers, keeping their stocks in order and keeping them filled up," said Mr. Carson. "For the small customer who sells lamps it has proved a good service, because he is not the type who would sit down and place an order for lamps. You have to go and tell him what he needs.

"The truck drivers in making their regular calls find out the needs of the dealer and in that way keep his shelves full of lamps, which means greater sales for the retailer. It was an original idea. I had never seen it done before. In some cases, as with a grocer, the man had never been trained to send orders in. In fact, some had never been trained to send in a check for what was owed. Our truck driver makes a delivery, a call, and he collects his money at the same time. It has been a profitable way to sell lamps," reports J. B. Carson.

Among other services to electrical contractors and industrial customers is the distribution to them each month of over 100 copies of ELECTRICAL SOUTH. "The customers get a lot of good ideas and it helps their business," said Mr. Carson.

NECA convention

(Continued from page 32)

never our intention. In my opinion the plan will work, if the parties exercise judgement and common sense."

After discussing other phases of the electrical construction industry in general terms, he concluded:

"I do not believe we can expect our problems to diminish in the foreseeable future. I am less concerned about our problems than I am about the cooperative effort necessary to solve them."

In the final session, NECA adopted a change in the constitution calling for three executive committee meetings a year instead of four and a resolution calling for installation of service entrance equipment by NECA contractors instead of by some utilities which "are installing or plan to install" such equipment "with their own work forces."

Previously, the board of governors had elected two new vice-presidents—E. E. Leasure, of Chicago, for District 4, and A. L. Rowe, of Great Falls, Mont., for District 8, and re-elected John A. Beck, of Baltimore, for District 2, and W. R. Grasle, of Portland, Oregon, for District 6.

About 48 hours after conclusion of the NECA convention, a score of lighting equipment manufacturers who had exhibited with NECA and some other participants in that convention attended an Illuminating Engineering Society lighting exposition sponsored by the North Texas Chapter.

Lighting equipment of 28 exhib-

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FEDERAL PACIFIC ELECTRIC COMPANY has opportunities for Sales Engineers in Apparatus and Low Voltage Departments—Southeastern States—Electrical Engineering Degree or equivalent experience required. Outstanding opportunity for advancement. Apply by letter to W. L. Sullivan, Regional Manager, 5754 Peachtree Industrial Boulevard, Chamblee, Georgia.

itors was opened for inspection in a different section of the Memorial Auditorium. C. L. Crouch, national technical director for IES, addressed the guests, discussing recent changes in IES lighting recommendations.

Earl Dinsmore, of Dallas, served as general chairman of the lighting exposition which had been promoted for months ahead. Chapter chairman is E. L. Cole and secretary is W. T. Kimery.

Mr. Kimery said the exposition was conducted in conjunction with a regular chapter meeting, that attendance was 500 including architects, consulting engineers, building managers, utility and commercial lighting personnel, representatives of the Federal government from GSA, CAA, and the Corps of Engineers.

Code discussion

(Continued from page 74)

generally used for outside distribution and are, or can be, grounded through very low-value reactances. On potentials of 480 volts, solid grounding is generally preferable unless sensitive relays are used in conjunction with very low-value reactors. Below 480 volts, solid grounding should always be used.

The impedance values of grounding resistors and reactors, together with the ratings of the relaying equipment, should, in every case, be computed by competent engineers. Contractors who are not engineers themselves should know this and should not attempt to use such devices other than those specified.

At this point, I should like to emphasize that all resistance and reactance should be kept as *low* as possible in *all* equipment grounding paths and in low-voltage system grounding connections.

The sketches show required and permissible system grounding connections. In the next issue, we will discuss locations of grounding connections and methods of grounding.

Answers to Code test questions are as follows: (1. **F** section 2511) (2. **F** sec 2512) (3. **T** sec 2513) (4. **F** sec 2522) (5. **T** sec 2515) (6. **c** sec 2514) (7. **a** sec 2514) (8. **b** sec 2501 and definitions) (9. **c** sec 2516) (10. **a** sec 2517-c).

Helicopter

(Continued from page 56)

ground inspection, for it is impossible to inspect the undersides of crossarms and insulators from the air, Secor said. Five and one-half hours is the maximum day's work on air patrol. "After that time the observer's eyes tire, often to the extent that he seems to visually 'blank out', especially on a bright, sunny day," Secor said. Potomac Edison, like some other utilities, does not own the helicopters. The services of Inland Airways, Myrtle Beach, S. C., are leased at regular intervals.

Know the law

(Continued from page 80)

stead of beng personally served as the law required.)

A recent decision by the Kansas Supreme Court (Logan-Moore Lumber Co. v. Foley, 317 Pac. 2d 467) shows this to be specially necessary when the dealer or contractor furnishes materials or installations on the credit of a building contractor, rather than on that of the building owner.

In Kansas—and probably in many other states—when a subcontractor or supplier of materials to a general contractor files the legally-required notice of a lien claim against the property, the notice must give the name of the general contractor.

In this case, a lien statement was filed with the clerk of the district court within 60 days after the last materials were furnished to a building contractor, as required by the lien law. But instead of naming the contractor as the purchaser of the materials, the notice stated that "said material was furnished under a certain contract and running account" with the owner of the premises.

The Kansas Supreme Court decided that the lumber company's suit to enforce a lien was properly dismissed because the notice of lien filed with the clerk did not mention the general contractor as the one to whom the materials were furnished. This defect in the filed notice was not remedied by the fact that on the day the notice was filed the company wrote the owner, stating that the amount claimed under the lien was due for material purchased by the building contractor—naming him—"for the construction of your residence."

Specially important is the further decision by the Supreme Court that the defect in the notice could not be corrected by filing a new statement, naming the contractor after the 60-day limit for statement filing had expired.

This means that *no* defect in a Kansas lien notice can be remedied by filing a new or amended notice after the statutory time-limit has expired. This is probably true of defective lien statements filed under laws of many other states.

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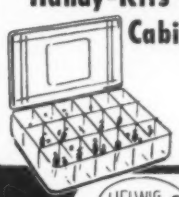

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Dossert Mfg. Co.

When you buy Motor Starters--

YOU PAY FOR OVERLOAD PROTECTION

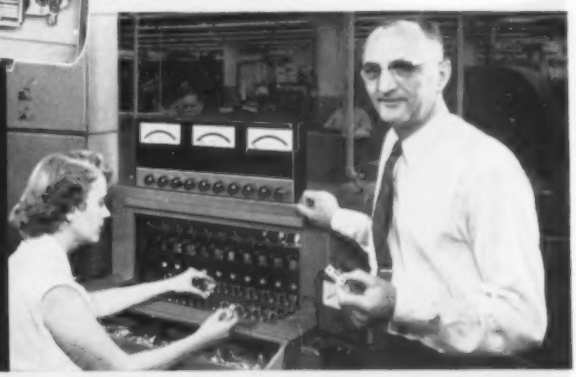
Only ONE-PIECE Overload Relays give 100% Protection • Only with ONE-PIECE construction can you *know* you've installed the heater correctly. Only with ONE-PIECE construction can you *know* the heater is exactly centered, or properly positioned, so that it performs according to its rating. Only with ONE-PIECE construction can you *know* your motors have full protection.

Only Square D has ONE-PIECE Construction • ONE-PIECE construction *eliminates* any possibility of heater misalignment. Square D melting alloy thermal overload relays can be installed only one way. They are tamper-proof. They are factory-assembled, are *individually* calibrated and tested. Repeated tripping will not affect accuracy.

Insist on Square D melting alloy thermal overload relays

***Write** for Bulletin SM-275 for the complete story on Square D starters with ONE-PIECE thermal overload relays. Address Square D Company, 4041 N. Richards St., Milwaukee 12, Wisconsin.*

...BE SURE YOU GET IT!



Heat-responsive element (solder pot) provides accurate response to overload, yet prevents nuisance tripping.

Heat-producing element is an integral part of overload unit. It's permanently joined to solder pot, can't become misaligned.

Individual factory inspection of every Square D melting alloy thermal overload relay means performance you can trust. Each unit is calibrated and thoroughly tested to make sure it will perform according to its rating.

EC&M HEAVY INDUSTRY ELECTRICAL EQUIPMENT...NOW A PART OF THE SQUARE D LINE

SQUARE D COMPANY

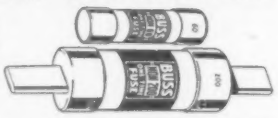
For voltage up to 600 . . .

There's a BUSS Fuse or FUSETRON Fuse to fit the needs of every user

If Non-Renewable Fuses are wanted . . .

BUSS One-Time Fuses

They save the user time and trouble because they get the same engineering care in manufacture as do all products carrying the BUSS Trademark.

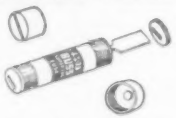


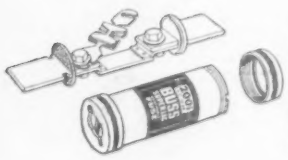
Every BUSS One-Time fuse can be depended upon to operate as intended under all service conditions.

If Renewable Fuses are wanted . . .

BUSS Super-Lag Renewable Fuses

The big advantage of these fuses over all other renewable fuses comes from the prevention of useless interruptions of service caused by needless blows.



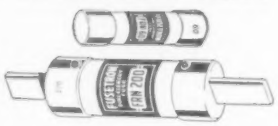


The reasons for this performance is found in the design of the fuse-case which assures good contact on the fuse link, even if the fuse is renewed by an inexperienced person—and by the time-lag built into the link that prevents the fuse from opening on motor starting currents or other harmless overloads.

If Fuses that — abolish all needless blows, stop overheating in panels and switches, protect motors against burnout are wanted . . .

FUSETRON dual-element Fuses

With rare exceptions, ordinary fuses or circuit breakers do not protect except against short-circuit but FUSETRON fuses provide TEN POINT protection.

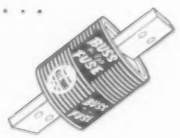


FUSETRON dual-element FUSES save everybody time and money because they are made to PROTECT — not to blow.

If SAFE protection on loads above 600 and up to 5000 amps is wanted . . .

BUSS Hi-Cap Fuses

On voltages up to 600, high speed operation on heavy shorts limits current to safe values. This minimizes damage to equipment and cuts down dangerous stresses on transformers.



If extremely fast opening on short-circuit is wanted . . .

Buss LIMITRON Fuses

BUSS Limitron fuses open quickly to limit build-up of fault current. They have an interrupting rating of at least 100,000 amperes AC and DC in all sizes, and in both 250 and 600 volt types.

If Plug Fuses are wanted . . .

BUSS Clear Window Plug Fuses

Their one-piece body and "safety" design guarantees protection.

They are most convenient to use too, because real big window and white backgrounds permits entire fuse strip to be seen. Even in poor light a blown BUSS fuse is easy to find.

If reduced blowing of plug fuses is wanted . . .

FUSETRON dual-element Plug Fuses

FUSETRON Plug fuses protect like ordinary fuses against short-circuits and overloads—but unlike ordinary fuses they won't blow on motor starting currents or other harmless overloads.

They are the type of fuses recommended in the 1953 National Electrical Code.

If making safe protection REMAIN SAFE as well as REDUCE blowing of fuses is wanted . . .

BUSS Fustats (have Type S base)

FUSTATS like Fusetron Fuses have a dual-element and therefore, stop needless blowing —and they do more.

They have a type S base that prevents anyone from replacing them with a penny or substitute—or using a size too large to protect.

FUSTATS fit standard plug fuse holders by means of an inexpensive adapter that locks in place and needs never to be replaced.

To protect motors and apparatus of voltages up to 125 against burnout . . .

0 to 14 ampere BUSS Fustats

A FUSTAT of the proper size installed to handle only the motor current will reduce to a minimum the chance of a motor burnout from any excessive over-current. In like manner it will protect solenoids, coils or transformers against burnout.

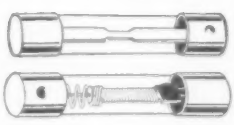
FUSTATS have the same degree of Underwriter's approval for both motor-running and short-circuit protection as the most expensive devices made. They give all the protection it is possible to obtain with any device on the market.

For protection of TV, Radio, Instruments, Radar, Avionics and Electronic Equipment . . .

BUSS and FUSETRON Small Dimension Fuses

A complete line is available. Made in Dual-element (slow-blowing) and One-Time types in sizes from 1/500 ampere up.

And there is a companion line of BUSS Fuse Clips, Fuse Blocks and Fuse Holders to take them.



BUSSMAN MFG. DIVISION, McGraw-Edison Co., ST. LOUIS 7, MO.